SEPTEMBER 199
ISSUE #4
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A WGI Publication
International Edition

73 Amateur Radio Today

SPECIAL ANTENNA ISSUE

Low-Cost TX Wire

Compact 160m Loop

Directional Ferrite Rod

The Challenge of 1750 Meters

73 Reviews

Yaesu FT-11R HT

, 300 Controllers

ntenna Switch

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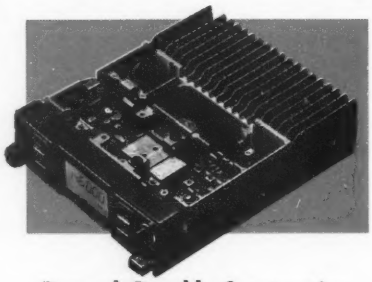

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Die Cast Aluminum Frame Construction – Meets the highest standards to provide reliability and long life. Will enhance your trade-in value years later.

Large Heat Sink – Dissipates the heat to maintain power output and stability characteristics.

Simple Operation

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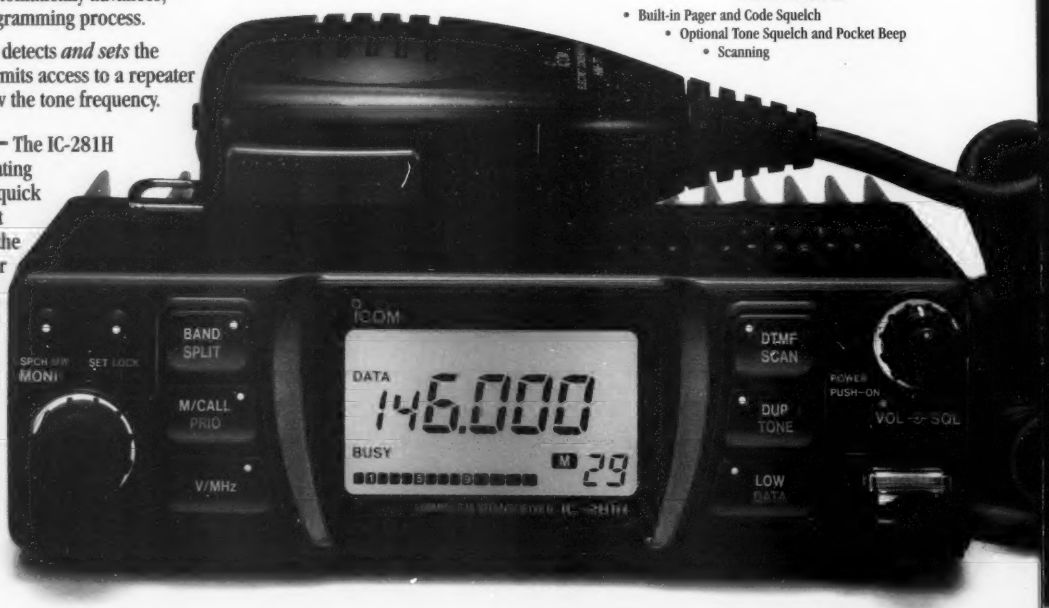
- Scanning



IC-281H 144 MHz FM Transceiver

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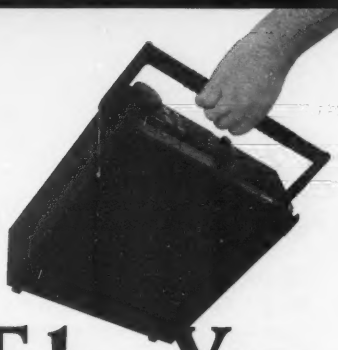

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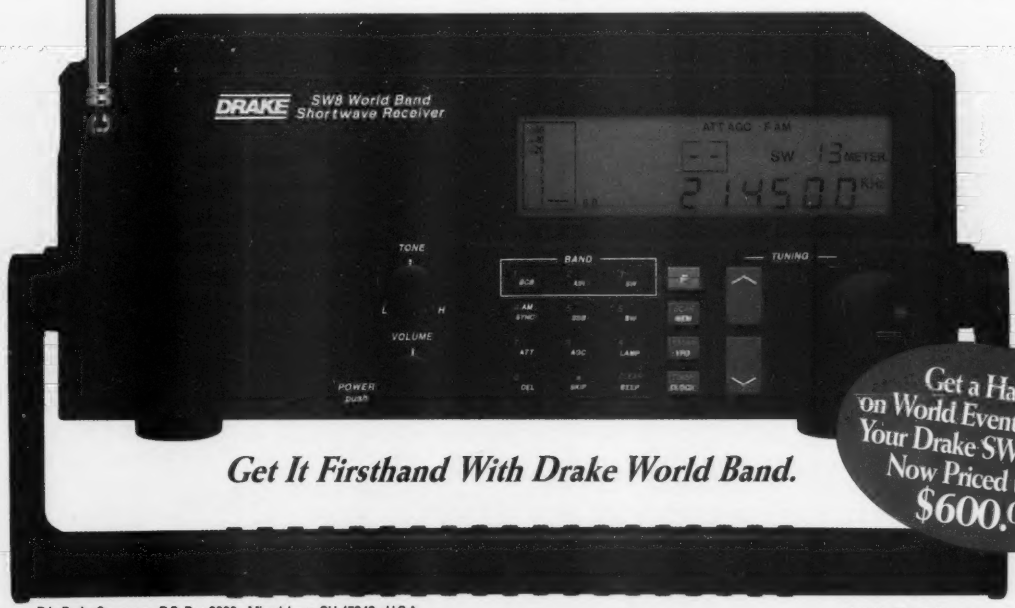

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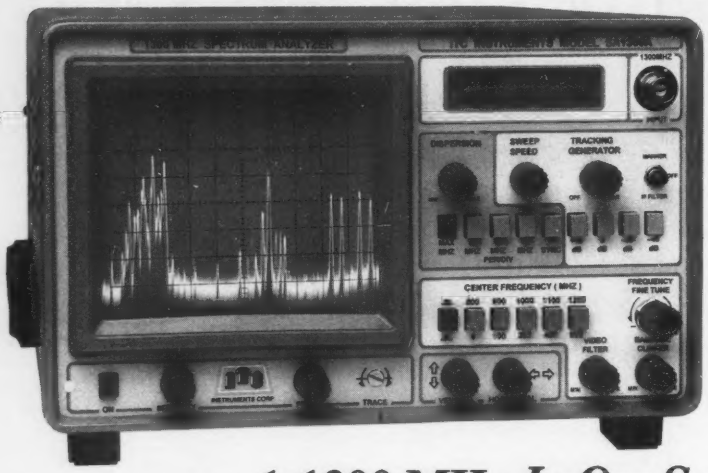

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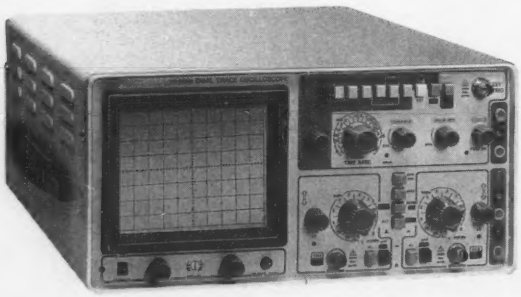

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On the cover: The new Comet HA-4S Mobile HF Antenna (photo by Wayne Holden). Read about it in "New Products," page 80.

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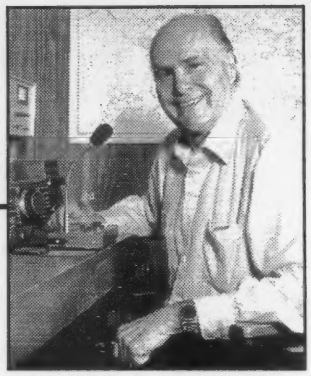

Retrospective

With the 35th year of *73* starting next month, it almost got me to thinking. Back in 1960, when I started the magazine I never would have guessed that I'd still be at it over 30 years later. I wasn't really thinking a lot about the future then. I just knew that the magazine was needed, so I went ahead and started it. *CQ* was mostly columns and contests; *QST* was club news. Builders needed a magazine.

I'd been editing *CQ* for five years before that and believed that hams wanted a magazine devoted to home construction. Having just been fired by *CQ*'s publisher, who wanted to just run monthly columns because it was cheaper, I sold everything I could . . . my boat, my plane, and even my little Porsche Speedster, and rounded up enough money to print the first issue of *73*. It was an enormous gamble, and I had no backup in case it didn't fly. It was a one-man operation, with me hustling subscriptions at hamfests, bending arms for articles, calling prospective advertisers, typing subscriber stencils, editing articles, cajoling columnists, and so on.

The worst time was in 1964, when the ARRL's so-called Incentive Licensing proposal to the FCC stopped the growth of the hobby dead for several years. Within a year the over-850 ham stores selling *73* had fallen to around a hundred, with the rest being forced out of business by tens of thousands of hams selling their equipment at fire-sale prices in panic over the ARRL's proposed new rules. This was when over 90% of the ham manufacturers went out of business, too. The mainstays such as Hallicrafters, Hammarlund, National, Johnson, Multi-Elmac, Gonset, Millen, Stancore, Thordarson, and so on disappeared.

When I latched onto 2m and repeaters in 1969 as a way to build interest, at first the readers hated it. Then, gradually, they found FM was fun and suddenly there was a new $100 million ham industry. It was this success, which only *73* promoted, and which we know today commercially as cellular telephones, that gave me the idea for plunging into computers in 1975, when the first microcomputer was introduced by one of my advertisers, MITS, in Albuquerque. That triggered the starting of *Byte, Kilobaud, Microcomputing, 80 Micro, Desktop Computing, InCider, Run,* and so on.

Eventually microcomputers challenged mainframes and minicomputers. In 1964 Gordon Moore, one of the founders of Fairchild Semiconductor, and later Intel, predicted that computer chips would get 30% cheaper every year, and that the number of transistors that could be built on a silicon chip would double every 18 months. These are known as Moore's Laws, and they are still valid 30 years later.

By 1983, eight years into the microcomputer revolution, I'd watched the industry grow at a steady rate of 235% a year. My own publishing mini-empire was growing at 100% a year. I joked that whenever there seemed like a possibility that we might be about to make a profit I'd start a new magazine and take care of that emergency. We were always operating right on the edge. Credit rating? When I decided to try and buy a house I couldn't find a bank that would give me a mortgage. I didn't care much, I was happy with using two rooms of my 40-room publishing house for a small apartment. But Sherry wanted a house. You know how women are. The nesting instinct, and all.

When it became obvious that no matter how much microcomputers were dismissed by the computer industry, they were going to win, I began to get overtures to buy my publishing company. I had the largest collection of magazines in the field, plus a healthy book publishing business, and a software company with over 250 titles. I also had around 220 employees, and every available building in town. I even bought the local motel and turned it into 26 nice offices, each with a shower. The restaurant was converted into a computer lab with 30 microcomputer development stations.

Bill Ziff of Ziff-Davis was bidding, as was Pat McGovern of IDG (*Computerworld*) Prentice-Hall, and others. A British group even flew me to London on the Concorde to see their operation. Though Prentice-Hall had the highest bid, once I met with their golf-club-oriented executives, I knew that wasn't what I wanted. I opted for IDG. I knew I had little choice as far as selling was concerned. The megapublishers wanted in, so it was either sell out for the best deal I could or get crunched. My fellow publishers who refused to sell were blown away.

When I sold my mini-publishing empire, my production and circulation facilities and everything else went with it. Sure, I was promised any services I wanted to start new magazinces, but the minute I asked for them, they were unavailable. I found I would have to start all over and build a new publishing organization. Without the publishing support services there was no way I could continue to publish *73*, so even though IDG didn't want to be bothered with a crummy little ham radio magazine, they took it.

Unfortunately they handled *73* the same way they did my six other magazines, putting corporate bumblers in charge. Within a couple years *73*'s ad sales and circulation had been cut in half. It was even worse with my computer magazines. *80 Micro*, which had been running over 600 pages a month and was the third largest magazine in the country, quickly sickened and died. *InCider* (for the Apple), which had been zooming, was soon almost wiped out by Ziff's *A+*. *Microcomputing*, which I'd started in 1976 and had been a steady profit-maker for seven years, was repositioned and died almost immediately. And so it went with *Hot Coco* for the Tandy Color Computer, *Desktop Computing*, the first non-technical computer magazine for businessmen, *Selling Micros*, a magazine for computer retailers, and so on. *Run*, for the Commodore, gasped on for a few years.

Meanwhile I started from scratch, buying a building in North Peterborough where I started *CD Review*. I knew that compact discs would quickly replace LPs, and I also knew that around 99% of the new CDs issued would be disappointing, so I figured that there was a need for a magazine rating new CD releases. I was right.

I had to buy new typesetting equipment. I went with the state-of-the-art Bedford system. It was expensive, costing nearly $1 million by the time we got through. They had only delivered part of the equipment when Bedford went into Chapter 11. We never got the rest of the equipment, or any money back. When we outgrew the Peterborough building I bought an old factory building in the next town, Hancock, and just about rebuilt it. New roof, new walls with insulation, and we divided it into offices.

CD Review soon became the leading music review magazine in the country, with over 200,000 readers and some fabulous success stories from advertisers. Reader surveys showed that our readers were spending over $250 million a month on compact discs.

It was along about this time that IDG got fed up with losing money on *73* and offered to sell it back to me. We finally struck a deal where I'd publish it for IDG on contract, and this continued until a couple years ago when IDG made an offer for *CD Review* that I couldn't refuse. Part of the deal was me getting back the ownership of *73*. Taking back *73* was a challenge. IDG had lost half the readers and angered most of the advertisers. I picked a new team to handle it and charged them to be first with reviews of new ham gear, to publish a ton of antenna articles, and to find all of the simple construction projects they could. Also, I wanted them to try and cover as many of the sub-hobbies which make up amateur radio as we could. Plus I started writing editorials again.

It's been a slow climb back, but we've been gaining readers steadily. Before *73* did its nose dive it had had the most advertising of any of the ham magazines, plus the highest ad rates. How did we get away with that? The *73* readers were buying more stuff by a wide margin than the readers of the other magazines. We had a lock on the active hams, with *QST* being more of interest to retired hams who wanted "to support the League." We did a *QST* reader survey and found that 70% of the subscribers never even looked at the ads in the front of the magazine, and 50% didn't bother going through what is essentially a catalog section in the back. With half their readers uninterested in the advertising and not even bothering to look at it, it was no wonder the *73* readers were buying so much more ham gear.

The Music Business

Two things got me into the music business. Two things besides publishing a music review magazine, that is. I've always loved music, so I was having a ball helping to review new CD releases. My specialties were classical, country, and ragtime.

When I heard Scott Joplin's music in *The Sting*, I wondered how I'd managed to miss something so wonderful. I bought every LP of Joplin's music I could find and played them night and day for months. I got so I knew every note of everything known of Joplin's. But the more I listened, the more I felt that none of the performers really understood what Joplin had written. None of them were doing it right.

While attending a music business

Continued on page 74

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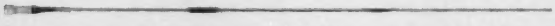
DUAL-BAND MOBILE ANTENNAS

FL-67S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.5dBi ⅝ wave 446MHz 7.2dBi ⅝ wave x 3	1.5:1 or less	150 watts	4' 11"	Gold Plated PL-259



FL-62S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 3.5dBi ½ wave 446MHz 6.0dBi ⅝ wave x 2	1.5:1 or less	150 watts	3' 5"	Gold Plated PL-259

NEW!

SB-7/SB-7NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.5dBi ⅝ wave center-loaded 446MHz 7.2dBi ⅝ wave x 3	1.5:1 or less	70W FM	4' 7"	PL-259 or NMO style

NEW!

SB-5/SB-5NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 3.0dBi ½ wave 446MHz 5.5dBi ⅝ wave x 2	1.5:1 or less	120W FM	38"	PL-259 or NMO style

NEW!

SB-2/SB-2NMO Dual-Band 146/446MHz

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi ¼ wave 446MHz 3.8dBi ⅝ wave	1.5:1 or less	60W FM	18"	PL-259 or NMO style

NEW!

B-10/B-10NMO Dual-Band 146/446MHz, Cellular Look-a-like

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 0dBi ¼ wave 446MHz 2.15dBi ½ wave	1.5:1 or less	50W FM	12"	PL-259 or NMO style

B-20/B-20NMO Dual-Band 146/446MHz, Cellular Appearance, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi ½ wave 446MHz 5.0dBi ⅝ wave x2	1.5:1 or less	50 watts	30"	PL-259 or NMO style

NEW!

SB-25/SB-25NMO Mono-Band 146MHz w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 4.1dBi ⅝ wave center loaded	1.5:1 or less	100W FM	4' 9"	PL-259 or NMO style

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TRI-BAND MOBILE ANTENNAS

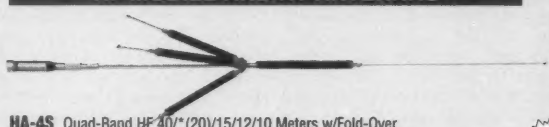
CX-224/224NMO Tri-Band 146/220/446MHz, w/Fold-Over, No Ground Plane Required

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz 2.15dBi ½ wave 220MHz 3.6dBi ⅝ wave 446MHz 6.0dBi ⅝ wave x 2	1.5:1 or less	100 watts	3'	PL-259 or NMO style

FJ-15S Tri-Band 52/146/446MHz w/Fold-Over

Gain & Wave:	VSWR:	Max Power:	Length:	Connector:
52MHz 2.15dBi ¼ wave 146MHz 4.5dBi ⅝ wave 446MHz 7.2dBi ⅝ wave x 3	1.5:1 or less	120 W FM	4' 10"	PL-259

HF MOBILE AND HT ANTENNAS



NEW!

HA-4S Quad-Band HF 40/*(20)/15/12/10 Meters w/Fold-Over

Wave:	VSWR:	Weight:	Length:	Max Power:	Connector:
¼ wave	2:1 or less	1 lb. 14 oz.	4' 4"	120W SSB (200W SSB 28MHz)	PL-259

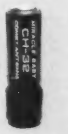
*L-14HS Optional 20 Meter Coil

SH-55 Super Flexible 146/446MHz HT Antenna

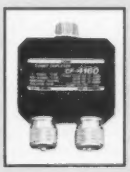
Gain & Wave:	Max Power:	Length:	Connector:
146MHz 1.5dBi ¼ wave 446MHz 3.2dBi ⅝ wave x 2	10 watts	15.5"	BNC

CH-722SA High Gain HT Antenna
Gain & Wave: 146MHz 3.0dBi ½ wave
446MHz 5.5dBi ⅝ wave x 2
Max Power: 50 watts
Length: 35", 2 sections, 18" each
Connector: BNC

CH-32 Miracle Baby 146/446MHz HT Antenna
Gain & Wave: 0dB ¼ wave
Max Power: 10 watts
Length: 1.75"
Connector: BNC



DUPLEXERS AND MOBILE MOUNTS



CF-4106K, I, J, 146/446MHz
Band Pass, Ins Loss, Max Pwr.
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

	4160K	4160I	4160J
Output:	SO-239	SO-239	SO-239
Low In:	PL-259	PL-259	SO-239
High In:	PL-259	N-Male	SO-239

RS-21
Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.

NEW!

RS-820
Heavy-Duty, Low Profile Trunk Lip or Hatch Back Mount. Rubber-coated base protects vehicle paint.

WS-1M
Multi-Adjustable Window Clip Mount.
11.5 feet of high quality coax. Gold-plated UHF Conns. for Antennas up to 40" in height.

NEW!

3D4M Standard Cable Assembly
13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.

3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax

CK-5M Deluxe Cable Assembly
13 feet double shielded very low loss coax + 12" RG-188 teflon coax. Gold plated UHF (PL-259/SO-239) connectors.

CK-5M5 Deluxe Cable Assembly
Same as CK-5M, but 17 feet of coax

LETTERS

Number 2 on your Feedback card

From the Ham Shack

Bill Burden WB1BRE, Strafford VT Wayne, I was talking with the Police Amateur Radio Team (PART) people down in Westford, Massachusetts, recently. They monitor 146.52 24 hours per day, covering parts of Rte. 3 South and 495 West, so that hams can call emergencies directly in to the police station. The information is then relayed immediately to the appropriate service via the police communications system.

It has been interesting to watch the dramatic change in the number of calls handled through PART since the advent of cellular telephones. When this service was started many years ago, almost all emergencies were called in through the PART system. Recently, the drop in calls has been significant and is putting the amateur radio resource into a marginal value situation.

I have been here in Vermont for over two years now and have been able to monitor emergency communications activities on several occasions where amateur nets were activated for support. My strongest impression has been one of amateurs talking to other amateurs with little or no contact with the operating agencies. I finally found out why! It seems that here in little Vermont they have installed a statewide microwave system with 200-300 channel capability and agency intercommunication is a standard thing. Further, the sites and system have been "hardened" to survive the harsh weather, loss of power, etc., so that the state communications system functions well in all conditions.

One rumor I got from the activities surrounding the latest Los Angeles earthquake was that many cellular phone systems survived and operated well and that one of the telephone BBSs was handling large-volume health and welfare traffic for the area.

Recent discussions among some of us here in New England support the notion that our role in emergency communications is changing. While we will still need the capability to provide support in some extraordinary circumstances, much of the work we used to do is handled on a more routine basis by the serving agencies now. They have put more money into developing sophisticated and "hardened" systems. In some ways, we may be victims of having done a good job of convincing these people, by word and example, of the value of a good emergency communications system. We are finding that we need to form more alliances with groups that, for reason of cost or skills, simply do not have good emergency support communications. A clear example is the American Red Cross. Our relationship is very good and we can provide a valuable service in setting up communications networks between shelters. The Skywarn program promises to put amateur radio in a position to be a vital resource in times of weather emergency.

There is no question in my mind that our role in emergency communications is changing and we need to think about our future and seek new and innovative ways to utilize our skills in emergency work so we don't find ourselves on the outside looking in.

Phillip Kawa KA1WJQ, Weymouth MA Wayne, I have never heard of any of your code tapes but your editorial described a "process of elimination method" which is certainly a logical approach to learning code because the human mind wants to be logical. Very good, but not a major breakthrough; however, I would like to hear one of your tapes.

Now "MY Method" (which you fault me for keeping a secret although it's been advertised in *73* and *Radio Fun* for the last three years, is manufactured by IMPS, and is the only code tape *ever* to get air play on commercial radio and Dayton TV 6 o'clock news channel 22) uses a simple rhythm method for character recognition and it is better measured in "beats per minute" then characters per minute. It takes students about six minutes to familiarize themselves with 43 code characters. My tape is a major breakthrough! (Available from Kawa Records, P.O. Box 319-ST, Weymouth MA 02188.)

I have been working with a 75-year-old retired mathematics instructor/high school principal to create text for a newer and faster version of "The Rhythm of the Code" at 20+ wpm and he explained the following to me:

The human mind responds to rhythm. When we speak there is a rhythm to it. When we write (like your editorials) there is a rhythm to it. When a rhythm is applied to Morse code it becomes simple to learn. The "Rhythm of the Code" tape does this.

When you were in the Navy, did you ever notice a certain rhythm to a Navy ship CW call, such as NEFM or NERK (tap your foot while you sound out these rhythms)? Get it? This is the principle I used in my method and will use in future versions of "Rhythm of the Code" that I will create.

Phillip—My code tapes aren't any different from most others, or from random code generated by a computer program. The difference has to do with not *learning the characters before you start. This is insidious in that it sets up a look-up table in one side of the brain. The ear output is fed into the other side. The next step is to send the dots and dashes over and look up the character. Then the character is sent back to be written. It's this back and forth activity which causes the so-called plateau at 10 wpm. That's the speed of the brain. When you reach that you are deep into frustration territory.*

The fast way to learn the code is to start listening to random code at the speed you want to learn. Start listening for E's and write them down as they go by. There's no thinking whatever involved. You are training your hand to write what your ears hear automatically. This quickly becomes a subconscious operation and thus is far faster than the look-up system. Once the E's are automatic, add T's, and gradually work your way through the alphabet. It's easier to learn the most-used letters first: ETAION SHRDLU.

Most people can learn 13 per in about two days this way. 20 per doesn't take much longer.

The whole idea is to make the operation completely automatic so the op doesn't have to think or even listen. Otherwise, one missed letter and a word is gone before the hapless op can get back with it.

No, I never noticed any rhythm to Navy Fox. It just came at 18 per endlessly, 24 hours a day, 365 days a year, in five-letter groups. But you know, with today's data transmission rates, we could send 50 years of Fox in 3.35 minutes? I still remember the BIMEK, CAQOF, and FUSAJ prefixes for Fox, telling us what deciphering system to use. Cheers . . . Wayne

Pete Bartholomey KD4GKQ, Jacksonville FL I would like to recognize one of your feature writers, Richard Togashi KN6PK, concerning his "Fast Charger" article in the May 1994 issue.

When I attempted to gather up the parts for this project I discovered that Digi-Key had discontinued stocking the 47 µH inductor (TK4355).

I mailed a letter to Mr. Togashi on May 18, requesting a substitute. He not only sent me a spare inductor that he had on hand (which I received on May 31), but also described how to modify a Radio Shack part if I wanted to construct the other version of the Charger described in the article. I wish to thank him for his instant response and for not leaving me high and dry without a replacement part. I trust that the rest of your staff is as concerned about your readers as he is and look forward to all the great projects *73* will come up with in the future. Keep up the good work.

Richard Mollentine WAØKKC, Overland Park KS Wayne, your comment that some men take ham radio too seriously could upset their wives. A good clue to the lady should be when the minister says, "And do you take this ex-young-lady, etc." and he answers, "Fine business," and later that night he kisses her and retorts, "73 and 88."

John W. Luebs N2PMQ, Camillus NY Wayne, your June 1994 editorial has moved me to respond.

I get so disgusted with the total lack of organization of your remarks each month, but I'll have to admit, I keep the magazine near my easy chair for many days until I can wade through everything. *73* stays in my living room longer than *CQ* or *QST*, and gets better read than any other magazine, as I want to eventually read all the many ideas and concepts you have to expound upon.

I would like to address a topic from your recent column: hamfests.

This past weekend my family and I participated in the Rochester Hamfest & Computer Show in Henrietta, New York. We drove the 85 miles from Camillus on Friday afternoon, took lodging in a motel, and attended the VIP dinner at the Marriott that evening. There, along with about 135 other hams and their families, we rubbed elbows and conversed with many of the organizers of the hamfest, bigwigs from the ARRL and *CQ* magazine. The "good ol' boys" were solidly in charge of this one. Talk about the "mossbacks" in the hobby. They were all there. My 10-year-old son and I were probably the only no-codes in the room.

This is the biggest hamfest in the Northeast. The facilities at the County Fairgrounds are inadequate to accommodate all the events, so the seminars were at the Marriott Inn, three miles from the other commercial activities. I doubt that many of the attendees took much interest in the seminars.

This year, I took a stall in the flea market to sell some unwanted equipment. I was one of hundreds of vendors. The amount of old, used and unwanted equipment was absolutely fantastic. Unfortunately, the number of vendors outnumbered the buyers, especially during Saturday. There were times when you could have shot a cannon down any aisle and not hit anyone. Prices came tumbling on computer items and great buys in complete computer outfits were finally down around $30 and still moving. Several vendors near me commented on how poor the sales were, and many were folding up by early afternoon on Saturday.

I have no official tally on the event, but I have heard that the total attendance was below previous years. As in the recent past, this hamfest was co-sponsored by *CQ*. For us, it was a great disappointment, but we had fun even if we didn't sell much. This traditional hamfest seems to be going the way of others in upstate New York. Reports from several earlier events in this area this year indicate that ham interest is dropping rapidly. The economy may have something to do with it, but I suspect most of the cause is covered in your editorial comments.

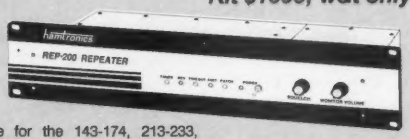
As you may surmise, I share many of your ideas and attitudes toward the amateur radio hobby. I too am concerned that the ARRL and the "good ol' boys" still dominating the hobby will cause us to lose much of our frequency spectrum, and further defeat the growing opportunities for radio activities with the new technologies. I wish I could do more, but you are doing quite a bit. Too bad your circulation isn't better. By the way, your magazine is getting better, and advertisers seem to be increasing. 73

You get more features for your dollar with the

REP-200 REPEATER

A fully microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

Kit $1095; w&t only $1295!



- Available for the 143-174, 213-233, 420-475, 902-928 MHz bands.
- **FCC type accepted** for commercial service in150 & 450 bands.
- **Six courtesy beep types**, including two pleasant multi-tone bursts.
- **Open or closed access autopatch, toll-call restrict**, auto-disconnect.
- **Reverse Autopatch,** two types.
- **DTMF CONTROL:** over 45 functions can be controlled by 4-digit dtmf command, via radio or telephone.
- **Owner can inhibit** autopatch or repeater, enable either open or closed access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr.
- **Change** cw speed and tone, beep delay, tail timer, and courtesy beep type **at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters**.
- Color coded LED **status indicators**.

NEW **REP-200T Voice Message Repeater.** As above, except includes Digital Voice Recorder. Allows message up to 20 sec. to be **remotely recorded off the air** and played back at user request by DTMF command, or as a periodical voice id, or both. ..... **kit $1145, w&t only $1395**

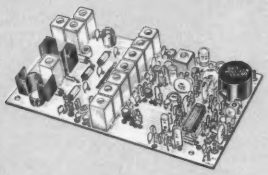
NEW **REP-200C Economy Repeater.** Like REP-200, except uses COR-6 Controller (no DTMF control or autopatch). Features **real-voice ID.** ..... **Kit only $795, w&t $1095**

REP-200N Repeater. Want to use your ACC controller, etc.? No problem! We'll make you a repeater with rf modules only. ..... **Kit only $695, w&t $995**

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

Also available in rf-tight enclosures, and with data modems.

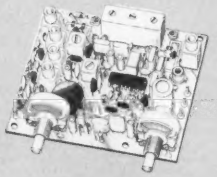
FM EXCITERS: 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l high band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz .....kit $109, w&t $189.
- **TA451**: 420-475 MHz .....kit $109, w&t $189.
- **TA901**: 902-928 MHz, (0.5W out); w&t $219.

VHF & UHF AMPLIFIERS. For fm, ssb, atv. Output levels from 10W to 100W. Several models starting at $99.

FM RECEIVERS:



- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **Sensitive** front end, 0.18uV, both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; .....kit $149, w&t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w&t $219.
- **R901 FM RCVR,** for 902-928MHz Triple-conversion, ...$169, w&t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res, if selectivity >100dB at ±12kHz .....Kits $129, w&t $219

NEW **R76 MONITOR FM RCVR** Kit for 10M, 6M, 73 MHz, 2M, hi-band, or 220 MHz. IF selectivity 60dB at ±12kHz. Great for monitoring repeaters, amateur calling frequencies, or packet radio frequencies, and for listening to commercial two-way radio, police/fire frequencies, or weather forecasts. **Good starter kit, too;** easy to assemble and align. .....**Kit only $59!**

- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Special if filters tailored for wideband fm. Lowest cost receiver available .....**kit only $89, w&t $149.**
- We also have preamps and receiving converters for 137 MHz, and we carry the *Weather Satellite Handbook* by Ralph Taggart.

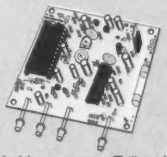
ACCESSORIES

COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier. .....kit $49

CWID. Diode programmable any time in the field, adjustable tone, speed, and timer. .....kit $59

COR-4. Complete **COR and CWID** all on one board. CMOS logic for low power consumption. EPROM programmed; specify call. .....kit $99, w&t $159

NEW **COR-6. COR & Real Voice ID** on one board. Digital ic records up to 20 seconds of your voice.



Can record multiple id messages. Tail and time-out timers, courtesy beep, solid-state relay to key transmitter. kit $99, w&t $149

Versatile DVR-1 DIGITAL VOICE RECORDER Module. As a **voice ID'er for repeaters**, records your voice, using the built-in microphone or external mic. Just the thing for **fox hunt** xmtr id! May also be used as a **contest caller** to play back one or more messages through your transmitter at the press of a switch. Used as a **radio notepad,** it can record the audio output of a receiver — up to 20 sec. of anything you might want to recall later. Play back as often as you like through a small external speaker. Extensive manual tells how to use multiple messages and adapt to many applications.

.....kit $59, w&t $99

TD-4 SELECTIVE CALLING Module. Versatile dtmf controller with 1 latching output. Mutes speaker until someone calls by sending your 4-digit tt code. Or use it with a long tt zero digit to alert anyone in club. Also may be used to control autopatch or other single device. .....kit $49, w&t $79

TD-2 DTMF DECODER/CONTROLLER. 16 digits, programmable, toll-call restrictor. Can turn 5 functions on/off. .....kit $89, wired & tested $149

AP-3 AUTOPATCH. Use with TD-2 for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver .....kit $39

TD-3 SUBAUDIBLE TONE DECODER/ENCODER. Adjustable for any tone. **Especially for repeaters,** with remote control activate/deactivate provisions .....kit $29, wired & tested $59

DATA MODEMS

MO-202 FSK DATA MODULATOR & DE-202 FSK DEMODULATOR. Run up to 1200 baud digital signals through any fm transmitter & receiver. Radio-link computers, telemetry, etc. .....kit ea $49, w&t ea $79

9600 BAUD DIGITAL RF LINKS. **Low-cost** packet networking system, consisting of MO-96 Modem and special versions of our 144, 220, or 450MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W. CALL.

Low Cost GaAsFET PREAMPS

LNG-(*)

ONLY $59 **wired&tested**

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-152, 152-172, 210-230, 400-470, 800-960 MHz.*

LNW-(*) MINIATURE PREAMP

ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY $89 **kit, *$119*** **wired&tested**

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

HELICAL RESONATOR PREAMPS

GaAs FET preamps with helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), *$80 vhf, $110 uhf.***

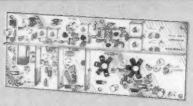
**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

RECEIVING CONVERTERS

Low noise converters to receive vhf and uhf bands on a 10M receiver.

- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).
- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**

TRANSMITTING CONVERTERS



XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

- Buy at low, factory-direct net prices and save!
- For complete info, call or write for free catalog. *(Send $2 for overseas air mail.)*
- Order by mail, fax, or phone (9-12 AM, 1-5 PM eastern time).
- Min. $5 S&H charge for first pound plus add'l weight & insurance.
- Use VISA, Mastercard, check, or UPS C.O.D.

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QRX . . .

Photo Search

Uncle Wayne wants you to shoot our next cover photo! Suitable subjects would include ham radio equipment, amazing antenna arrays, or better yet, catchy ideas of your own. Keep in mind that our format calls for a color photo which is: 1. Vertically-oriented; 2. Sharply focused; 3. Leaves extra room at the top and left side; and 4. Not too busy. We prefer 35mm prints.

Send your color prints to *73 Photo Search, 70 Route 202 North, Peterborough, NH 03458.* Please include a brief description of your photograph, your full name and callsign, and your permission to publish. We cannot return photos without an appropriately-sized SASE. If we do not use your photo on the cover, perhaps we'll find a spot inside. We've even been known to occasionally pay money for a good job. Good luck!

What's Your Expiration Date?

Amateurs receiving new or modified FCC licenses after June 8, 1994, should look carefully at their expiration date. Only new, first licenses or specific renewals are being given a full 10-year term. License upgrades, change of address, callsign, or name are now being processed with the original expiration date intact, instead of an automatic 10-year extension.

New software in the FCC's computers is now processing amateur radio licenses the same way as other Private Radio Service licenses. You should still submit renewal applications 60 to 90 days before expiration. Eventually, the FCC intends to mail expiration notices to amateurs. Renewals require a completed Form 610 sent to the FCC's licensing division in Gettysburg, Pennsylvania. *TNX Westlink Report, No. 676, July 19, 1994; ARRL.*

Going Up

If you plan on buying a new piece of ham gear that is made in Japan, you may want to do it now. Prices are expected to skyrocket soon due to the changing value of the yen versus the US dollar.

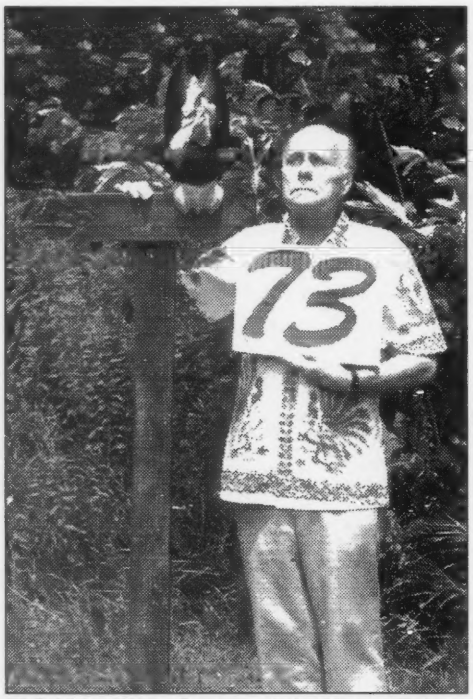
At press time, the US dollar has fallen to a new post-WWII exchange low. A year ago, a dollar would buy 125 Japanese yen. Currently, a dollar will only buy about 97 yen. Add to that the deep recession in the Japanese economy and you can see that it is unlikely that manufacturers can afford to cut prices to keep up with the exchange rate. *TNX Westlink Report, No. 676, July 19, 1994; Newsline.*

Less is More

Vice President Al Gore's call for the government to reinvent itself is leading to a reorganization at the Federal Communications Commission. What exactly will change is as yet unclear, but the FCC's Private Radio Bureau and licensing procedures are likely to be involved.

Rumors persist that there will be a new Wireless Services Bureau, possibly headed by current Private Radio Bureau Chief Ralph Haller. A new International Bureau, designed to coordinate global communications issues may also be in the works.

Whatever form the realigned FCC takes, it will have to be financed with less than anticipated revenues. The commission had hoped to get a $188.4 million budget approved for fiscal year 1995, but the House Appropriations Committee lowered that figure by nearly $20 million. *TNX W5YI Report, Issue #14, July 15, 1994.*



73 Publisher Wayne Green is entering his own 73rd year this month with no end in sight. In fact, reports of buzzards circling overhead are greatly exaggerated. The venerable entrepreneur is marking another milestone this September as well—73 magazine is entering its 35th year of publication. Time marches on! (Photo by Charles Warrington WA1RZW.)

Enter the DBS Era

It is being touted as the biggest launch of new consumer electronics technology in history. With most of the nation still totally unaware, the age of high-power Direct Broadcast Satellites (DBS) has begun. DBS is expected to be available nationwide by the end of this year!

Cable companies should be concerned, because DirecTV (GM Hughes Electronics) and USSB (Hubbard's US Satellite Broadcasting) have quietly rolled out their DBS offerings—a first step toward a 500-channel service. Currently, the DBS services are being test-marketed in Shreveport, Louisiana, and Jackson, Mississippi.

To receive DBS, you need a set-top digital satellite receiver/decoder box that links the TV to a small 18" dish antenna. Total cost of the needed equipment, including remote control, ranges from $650 to $900, depending on features. A major television ad campaign promoting DBS is set to launch this month. *TNX W5YI Report, Issue #14, July 15, 1994.*

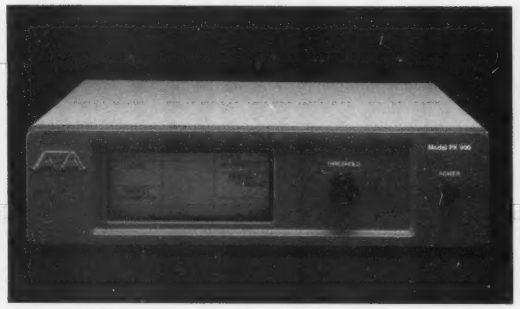
TNX . . .

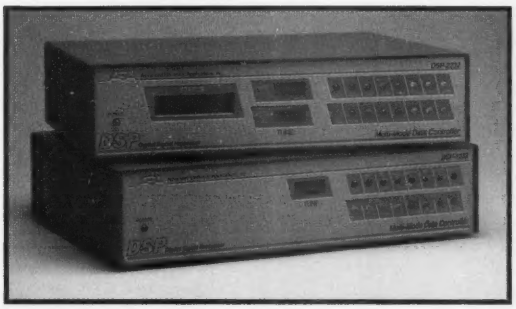
. . . to all our contributors! You can reach us by phone at (603) 924-0058, or by mail at *73 Magazine*, 70 Route 202 North, Peterborough, NH 03458. Or you can reach us on CompuServe ppn 70310,775 @compuserve.com; or at the *73* BBS at (603) 924-9343 (300-2400 bps), 8 data bits, no parity, one-stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 924-9327. 73

Data Controllers Put You In Control

PK-900

- Dual simultaneous ports.
- Automatic signal idenfication.
- 9600 bps modem option available.
- 8-pole Chebyshev bandpass filter.
- Dual-port Gateway: Packet to AMTOR, Packet to PACTOR, and Packet to Packet.
- Twenty software selectable modems.
- 17K Packet, PACTOR, and AMTOR MailDrop.
- 16-level gray scale fax with opt. software.
- Same modes as the PK-232MBX.
- Full PACTOR Memory ARQ.





DSP-2232
DSP-1232

- DSP-1232 has two switchable ports.
- DSP-2232 has two simultaneous ports.
- Same modes as the PK-232MBX.
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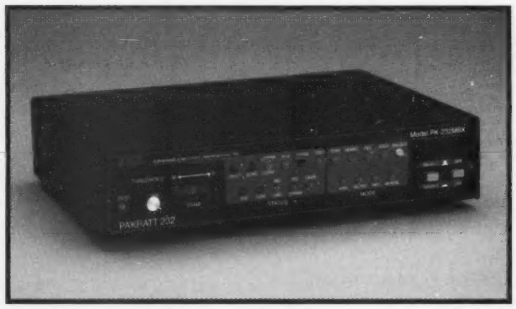

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Compact 160 Meter Transmitting Loop Antenna

You don't need to move to a new QTH!

by Richard Q. Marris G2BZQ

The 160 meter band (1800-2000 kHz) is beyond the reach of a high percentage of transmitting amateurs. Yet, this band can be most enjoyable, usually with a very high standard of operating. But—there are problems!

The fact is that most TXers have near-impossible antenna problems. These are: 1) a lack of sufficiently large real estate to erect an antenna; 2) local antenna restrictions regarding putting up a large antenna; 3) the impossibility of installing the necessary efficient ground system; 4) the apartment dweller's lack of antenna space; or 5) the "no TX antennas here" syndrome. Probably over half of the licensed amateurs live in apartments, or have very restricted space for a large outdoor antenna, or face "rules and regulations," or other restrictions.

The answer to "getting on the air" on 160 is a small indoor vertical multi-turn tuned loop which, though small in size, is difficult to load and match to the TX. If a balanced configuration is used, it will operate without a ground connection. Properly designed, such a loop will give yeoman service. It obviously will not compete with a 160 meter dipole or a Beverage, however, which few have space for.

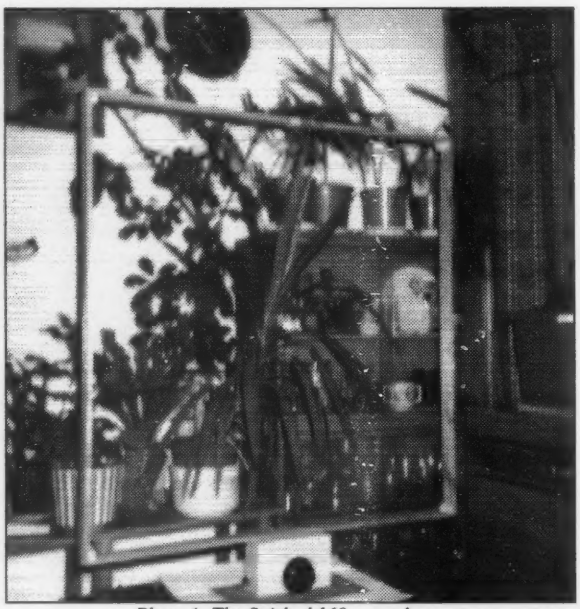

Photo A. The finished 160 meter loop.

The size of the loop will be dictated by the domestic space available, the amount of wire required (in turns!), and the absolute necessity to finish up with a design with *an exact number of complete turns*, i.e. no half turns, quarter turns or other part turns. Strangely enough, the proximity effect is far less critical than on 80 meter or higher band loops.

The circuit is simple but novel (see Figure 1), and shows six square loop turns resonated by variable capacitor C1 (with C2 in series), and loaded with coil L2, with a 50-ohm impedance matching tapping point. An optional ground connection is shown but, unless a really good radial ground is available, it is better not to use one at all at the loop. I use a water pipe as a ground, connected to the TX/RX input socket, and not the loop. The loop has been used with about 7 watts CW.

Figure 2 shows the neat profile of the loop. It consists of six wire turns wound around a 36" x 36" timber frame, mounted on a plastic box containing the resonating/loading/matching circuitry.

At this QTH the loop stands on a table alongside the operating position, with the tuning knob (C1) within easy reach. Operating is made easier with a large instrument knob. The room is about 20 feet above ground level. No doubt the more ingenious could stand the loop on the floor of a loft, with a conventional remote control turning mechanism.

C1 is a robust 150 pF variable capacitor, which was available, with a 150 pF high voltage (2KV) capacitor (C2) in series. Depending on availability, C1 and C2 could be replaced with a single 75 pF variable.

Construction

The main frame (Figure 3) is made of 1-1/4" x 3/8"-thick seasoned timber. This is assembled, as shown, to give a 36" x 36" square frame, reinforced with wood corner blocks and glued together. The whole frame is rubbed down with fine glass paper, and finished with teak wood stain. Onto this frame are wound six turns of 16/0.2mm PVC-covered wire (o/d = 1.8mm). This wire is rated as 3 amps at 1000 volts RMS. The wire turns are equi-spaced to approximately 1/4" apart, from center conductor to center conductor. The loop turns are terminated as shown in Figures 3 and 4C.

The tuning/matching unit (C1 + C2 + L2) is built into a gray (see the safety note at the end of the Parts List) plastic box 7-1/4" x 3/8" x 2-3/8" (see Figures 4A and B). The box is bolted (with the lid to the rear) to a solid wood base 12" x 8" x 1/2".

L2 is a self-supporting coil consisting of 30 slightly-spaced 1" diameter turns of 16-gauge tinned copper wire. The top end of L2 is soldered to a thin brass bolt through the box top, and hangs down, so that the bottom end is soldered to a thin brass strip used to connect the frame of C1 to the outer of the coaxial socket. The socket center conductor is tapped, via a short lead, to L2 (described later in this article).

The loop frame/winding (see Figure 3) is bolted to the top of the plastic box, using nylon bolts/nuts/washers (see Figure 4C) which

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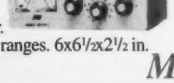

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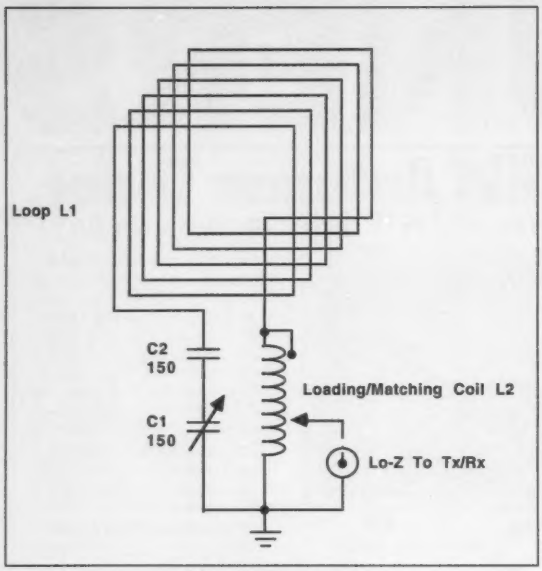

Figure 1. The circuit.

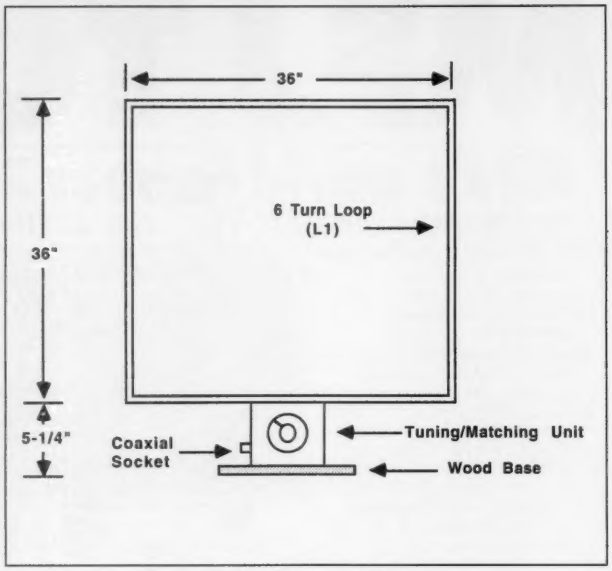

Figure 2. Loop profile.

pass through between turns three and four of the winding. Do not use metal bolts as these may partially RF short adjacent turns.

The loop is connected to the TX/RX with a short length (5 feet) of RG58 feedline.

Getting On The Air

The top tap on L2 (from end of L1) will determine the frequency range. For maximum efficiency, C1 should be set as near zero pF capacity as possible, at the HF end of the band (i.e. 2000 kHz).

The impedance matching tap from the coaxial socket is connected for the best impedance matching for 50 ohms. On the prototype this was at 19 turns up from the bottom of L2, and this should be used initially while the loop frequency range is adjusted.

Checking the frequency range on a receiver turned to 2030 kHz, try shorting out turns, from the top of L2. On the prototype it was necessary to short out the top two turns, to resonate the loop, on the RX, at 2030 kHz

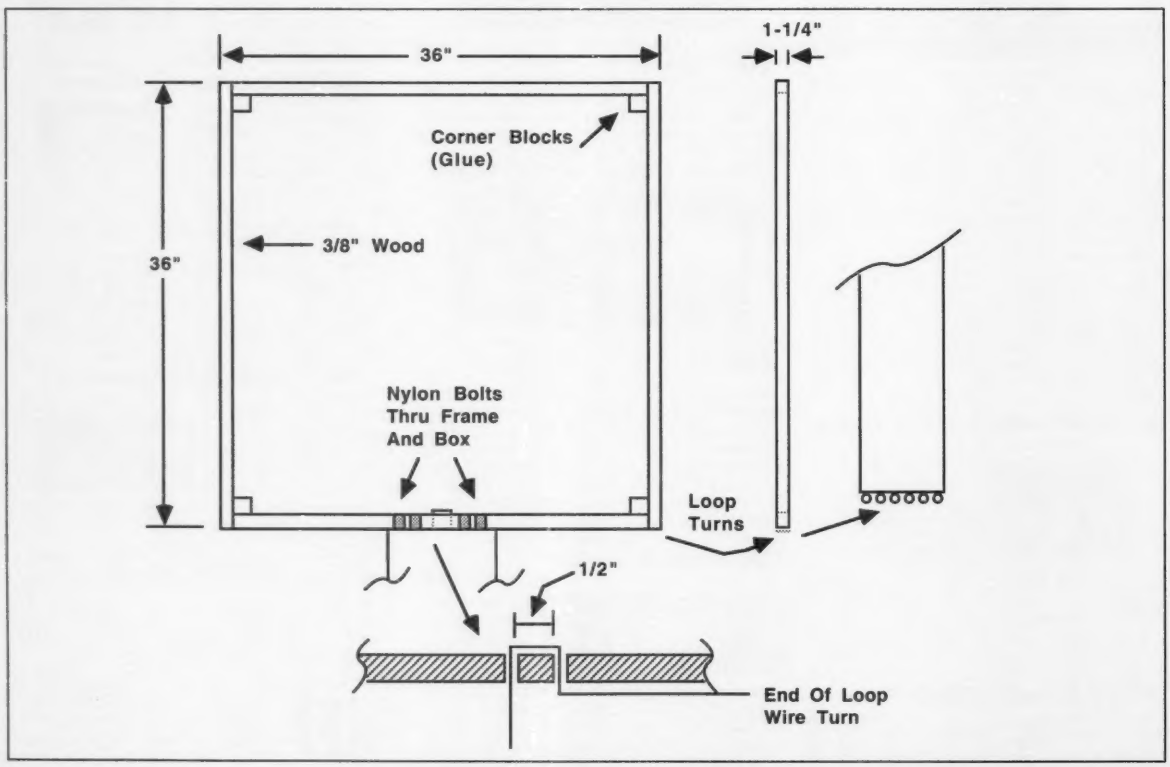

Figure 3. Main frame and loop winding.

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The Mexican Federation of Ham Radio Experimenters (Federación Mexicana de Radio Experimentors invites all amateur radio operators to our 53rd Annual Convention, which will be held in the beautiful paradise of Puerto Vallarta, Jalisco, Mexico, from October 6th thru 9th.

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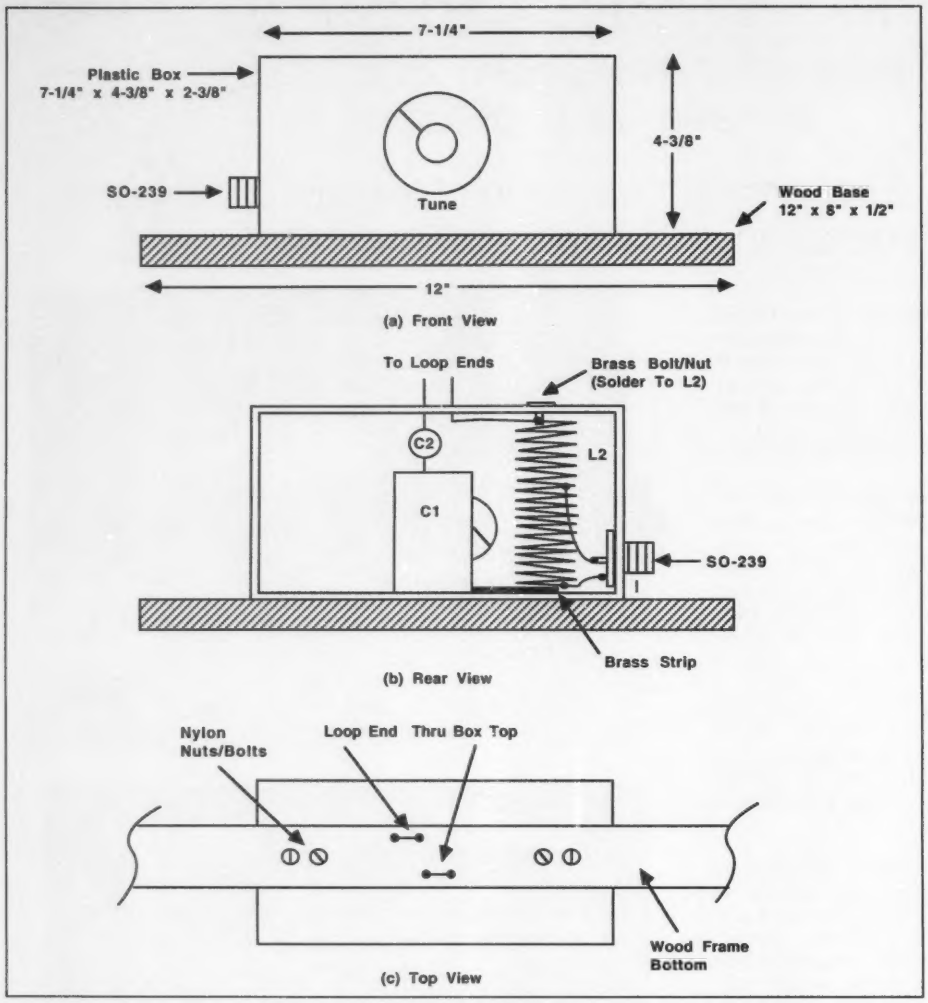

Figure 4. Tuning/matching unit.

with zero capacity on C1. It follows that to resonate at the 2000 kHz HF band edge, it will require a small amount of capacity on C1. The loop will now resonate throughout the band by adjusting C1, with no further coil adjustment necessary.

Apply a few watts to the loop and it should load quite easily at the TX frequency. Due to the possi-bility of minor differences in individual construction, the impedance matching tap, on L2, should be tried +/- a little to obtain best matching.

The loop is now ready to try "on-the-air." The usable bandwidth, on a fixed setting of C1, is about 11 kHz on the prototype. The advantage of this narrow bandwidth is twofold: The loop acts as a comparatively narrow bandwidth bandpass filter eliminating harmonics and TVI; it also reduces ambient noise and general man-made interference on the receiver. The loop has been used with about 7 watts CW with the TX having a Pi-output circuit.

Remember: TX frequency = loop resonant frequency = RX frequency. Have fun!

Parts List

Qty.	Part
1	Variable capacitor (C1) 150 pF wide space receiving type (see text)
1	Capacitor (C2) 150 pF silver mica or ceramic disc (2 kV)
1	2 oz. reel of 16 gauge tinned copper wire.
1	Coaxial socket
Loop wire	16/0.2mm high temperature PVC wire (o.d.= 1.8mm), 3 amps at 1000 volts RMS
1	Plastic box (*not black) 7-1/4" x 4-3/8" x 2-3/8" minimum
2	Lengths of dry seasoned timber 6'0" x 1-1/4" x 3/8"
1	Small tin of teak wood dye and glue
1	Baseboard 12" x 8" x 1/2" timber

Safety—Plastic Boxes:** It has been suggested that some *black* molded plastic boxes are made using recycled plastic, and that carbon black is used for black coloring (obviously not good at RF). It has been impossible to check this as many boxes are molded in Taiwan, etc., so: **Safety First.

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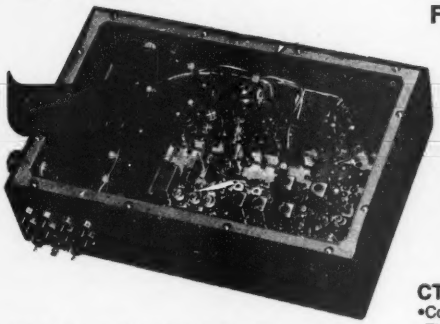

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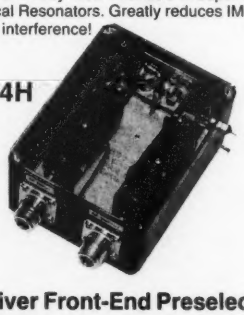

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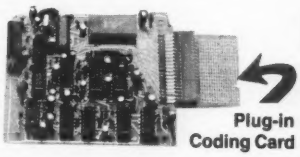

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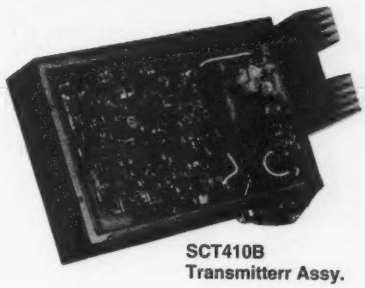

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The Discriminator

A directional receiving antenna for hams and SWLs.

by Richard Q. Marris G2BZQ

The Discriminator is a ferrite loop high performance experimental directional receiving antenna, designed for use between 1600 kHz and 4000 kHz. This frequency range covers the 80 and 160 meter amateur bands, marine beacon and communication bands, some aircraft activities and, of course, a large number of broadcast stations worldwide. It should be of interest to both the TXing and SWLing amateur.

The circuit is pictured in Figure 1. The design will produce a perfect figure-eight polar diagram with acute nulling at 90 and 270 degrees (Figure 2A). In addition, with the aid of an optional sensing rod antenna, the polar diagram can be changed to a cardioid configuration, as shown in Figure 2B.

Mounted on a turntable, the Discriminator will eliminate QRM and QRN, and also, with some practice, will, if required, give direction-finding facilities.

The Figure 1 circuit shows a balanced ferrite rod loop L1 tuned by C1A and C1B, coupled to the receiver's 50 ohm input via L2. The nickel zinc ferrite rod is unusually 15" long and 1/2" in diameter. This long rod substantially increases the RF signal voltage. The winding width of L1 is about one ninth of the total rod length, so very acute nulling is achieved, to a far greater extent than would be expected with a single 7-1/2" or shorter ferrite rod. For those not requiring sensing facilities, the ferrite loop L1, C1A, C1B, and L2 can be used as an efficient entity (see the right side of the assembly profile in Figure 3).

To produce an optional cardioid polar

Continued on page 18

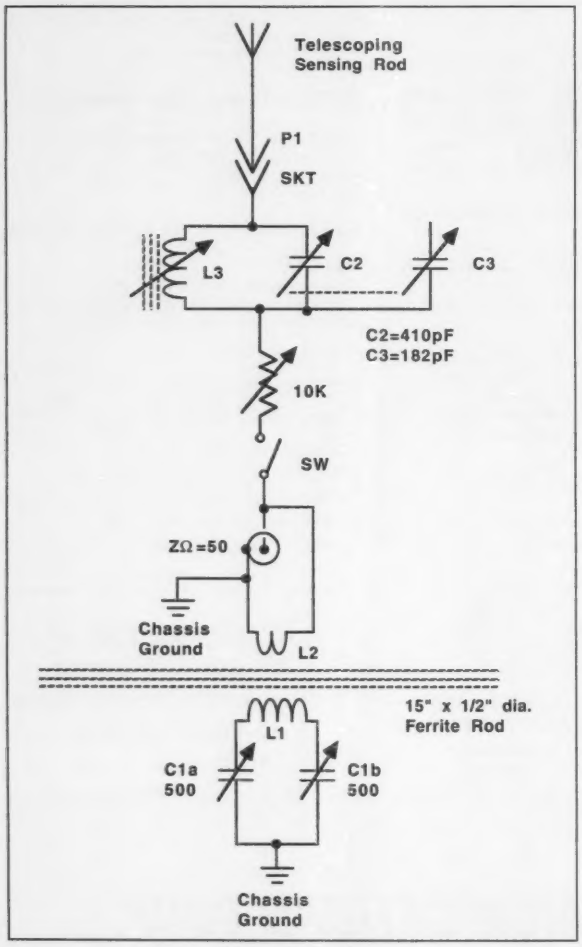

Figure 1. Circuit.

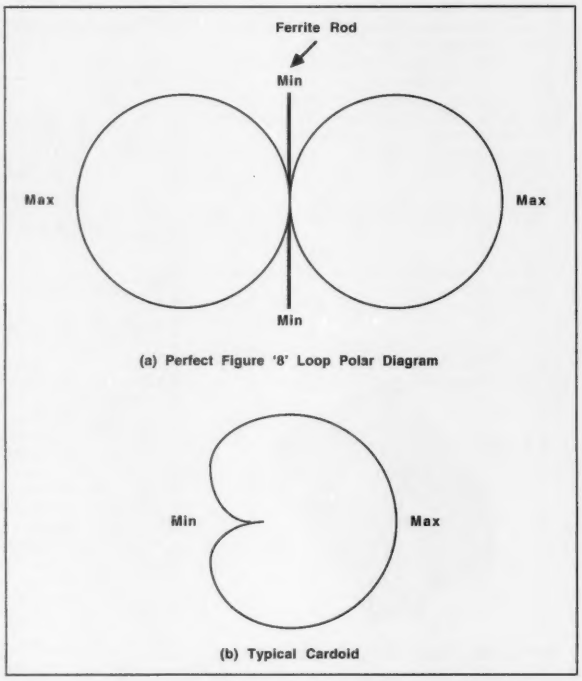

Figure 2. Polar diagrams.

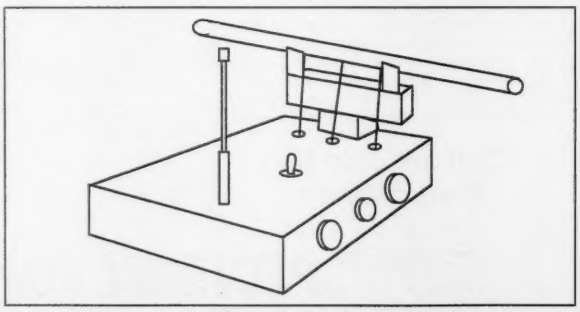

Figure 3. Profile.

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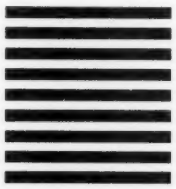

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diagram (Figure 2B), the sensing circuit consists of a short vertical sensing rod resonated to a quarter wave by L3/C2, with a 10 kilohm variable phasing control resistor R. The switch SW enables this sensing circuit to be switched in/out when required (described later in this article).

The original very experimental proving model was assembled on a sheet of circuit board, with the sensing rod stuck out on a wood boom arm. Two things became immediately apparent: A 15" horizontal ferrite rod was very vulnerable to damage and would require protection; and the vertical sensing rod, on its horizontal boom together with a 15" rod, produced a most ungainly and unwieldy contraption. The problem was solved with chassis construction: a robustly protected ferrite rod assembly, and a plug-in telescopic sensing antenna rod.

Construction

The whole final assembly was built on an aluminum chassis size 8" wide x 2-1/2" deep x 2-1/2" high. The profile (Figure 3) and layout (Figure 4) shows the horizontal 15" ferrite rod on the right, with the control knob of resonating capacitor C1A and B to the righthand front. The vertical sensing rod plugs into extreme left with the resonating capacitor (C2) knob in front. The phasing resistor knob is in the center front, with switch SW above on the chassis. A very essential dimension is the 6-1/4" distance between the sensing rod and ferrite rod. If the cardioid sensing facilities are not required, then the chassis width could be reduced to 3" or so. If necessary, there is room for a wideband RF amplifier under the chassis, which has a removable bottom plate.

The chassis underside (Figure 4) is self-explanatory. C1A+B is a conventional 500 + 500 pF U-frame variable capacitor, mounted on the chassis front. C2 + C3 is a similar 410 pF + 180 pF variable mounted on an insulating bracket, with insulated control shaft. Variable resistor R is direct on the chassis front.

L2 consists of 30 close-wound turns of 22 gauge enamel copper wire wound on the end of a 1-1/2" x 1/2" diameter paxolin tube, and fitted with flex ends. The 3/8" diameter ferrite rod was cut to 1-1/2" from a length of salvaged rod from an old radio.

The step-by-step fabrication of the ferrite rod L1 and L2 assembly is shown in Figures 6 and 7. Two 7-1/2" long x 1/2" diameter nickel zinc ferrite rods, type R61-050-750, are adhered end to end (see Figure 6A). The rods' ends are cleaned with fine glass paper, and adhered together with a cyanoacrlate adhesive (e.g. Superglue). It sets within a few seconds. Next, wind one turn of 4"-wide self-adhesive label at the rod center (see Figure 6B). L2 is close-wound using 36 turns of 0.9mm o.d. PVC-covered 10/0.1mm connection wire (see Figure 6C), with the ends held in position 4" apart by 1"-wide masking tape. Over this wind two turns of 1"-wide masking tape at the center of L1, over which wind four turns of PVC

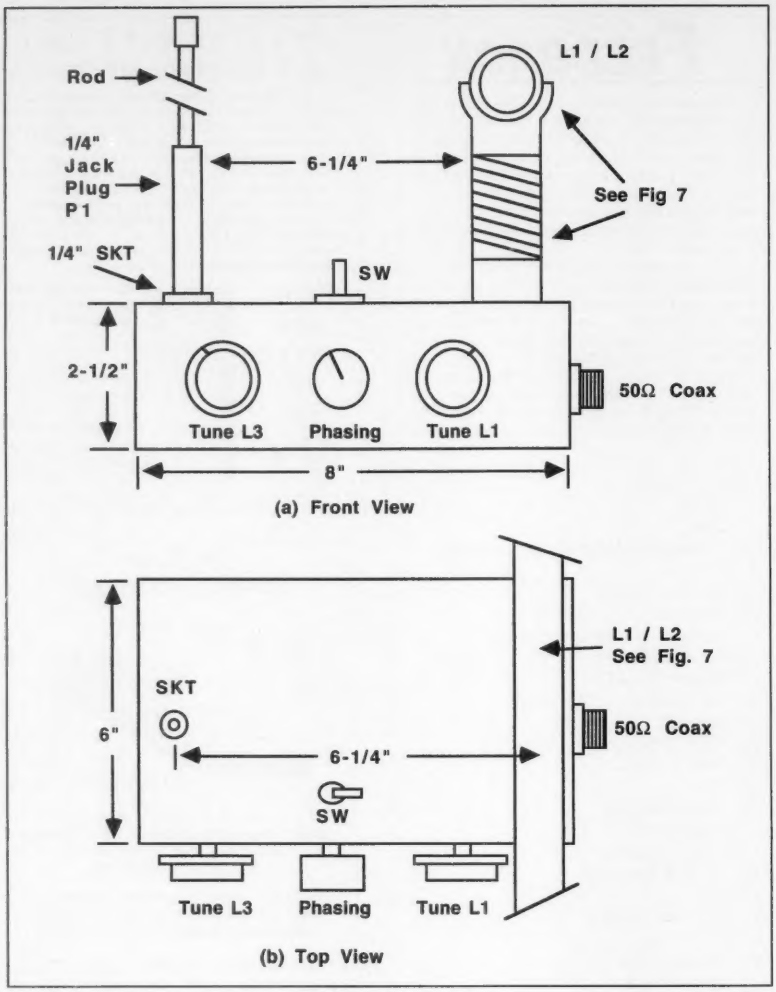

Figure 4. Layout.

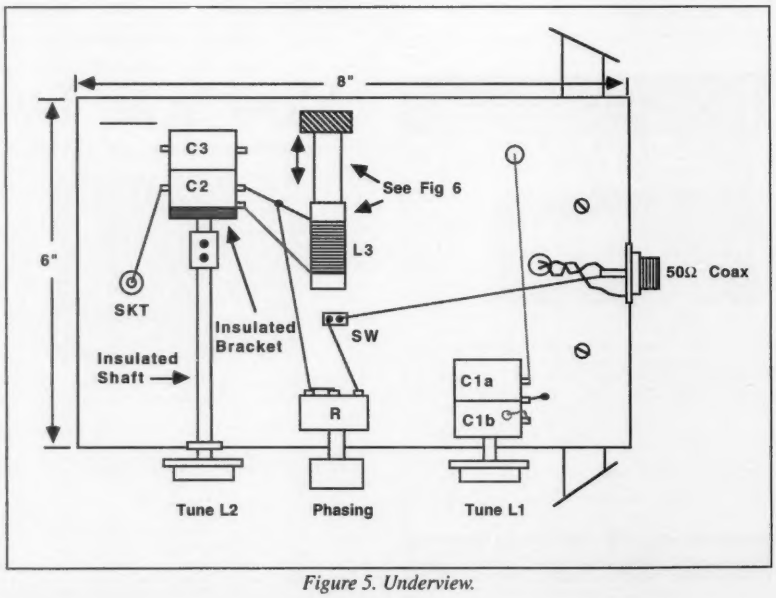

Figure 5. Underview.

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SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
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RS-5L	4	5	3½ × 6⅛ × 7¼	7

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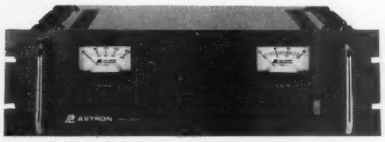

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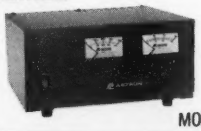
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

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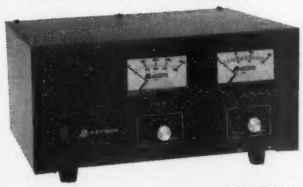

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VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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hookup wire, with the ends twisted lightly together, as shown in Figure 6D.

The above assembly is protected and mounted, as shown in Figure 7A, in a 16" length of 7/8" o.d. PVC pipe used in plumbing, mounted and held in place on a robust "T"-shape wood frame and held to the main chassis with wood screws. Three 1/4" diameter wire exit holes are drilled in the tubing, one at the center and the others 4" apart as shown in Figure 7C. The rod/winding assembly is inserted into the tubing and the coil wire ends pulled through the 1/4" holes. The rod ends are supported by coils of 2"-wide thin coiled card, inserted into the ends of the tube around the rod ends. The "T" support, shown in Figure 7B, is made of dry timber, varnished, with two plastic tubing wall clips screwed on either end (shown in Figure 7B).

The plug-in sensing antenna rod is a standard 20" telescopic whip. The end is soldered to a 1/4" plastic-sleeved jack plug center connection. A corresponding jack socket is fitted to the main chassis (see Figures 4A and Figure 5). The distance from this socket to the center of the ferrite rod assembly was calculated by experiment and is 6-1/4" (see Figures 4B and 4A).

The whole underchassis assembly and wiring is shown in Figure 5.

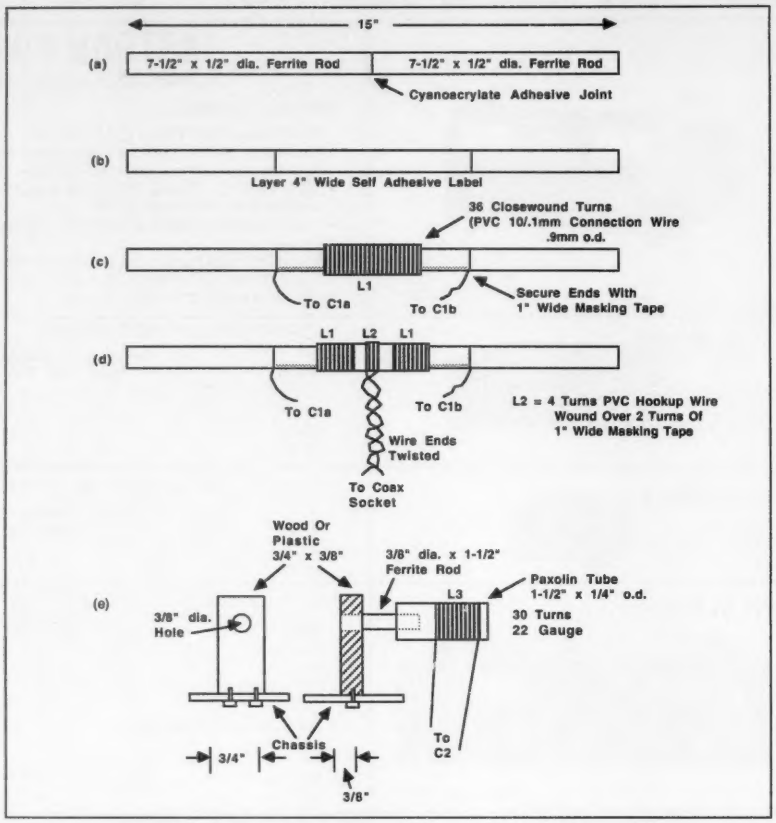

Figure 6A, B, C, D: Ferrite L1 and L2 assembly; E: coil assembly.

Setting Up

The unit should be connected to the receiver input with not more than 36" of RG58 coaxial feedline. Set-up procedure is as follows.

(1) Ferrite Rod/L1/L2 Assembly: With the sensing rod removed and the switch OFF, set the receiver to a signal around 2000 kHz and rotate C1A and B to resonance. Rotate the unit for maximum signal—see the polar diagram in Figure 2A. Rotate the unit to check the acute nulling. Repeat this operation at 1600 and 4000 kHz, and spot frequencies in between. The prototype covers from 4100 kHz to below 1600 kHz. This part of the unit can, as previously mentioned, form a self-contained, highly efficient ferrite rod antenna on a reduced 3" wide chassis, producing the polar diagram shown in Figure 2A.

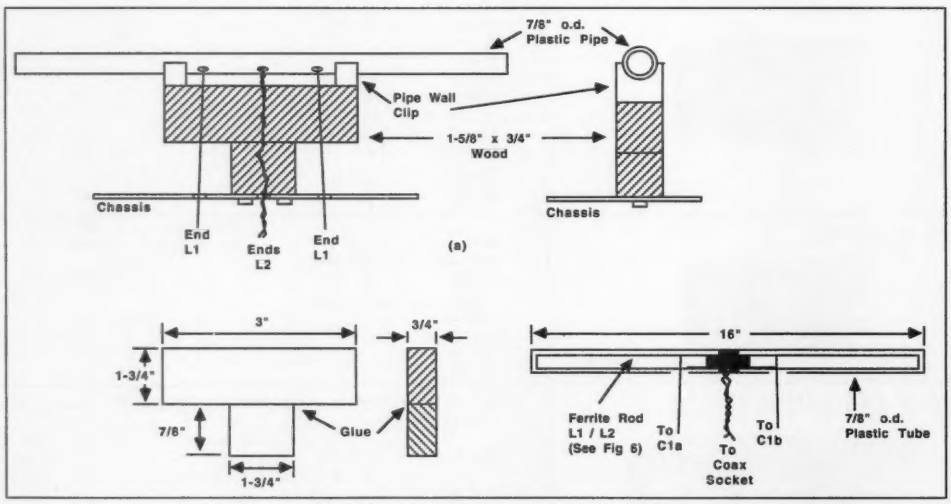

Figure 7. Ferrite rod coil and support assembly.

(2) Sensing Rod Circuit: Plug in the telescopic whip, put the switch to OFF and rotate C2 to near minimum capacity. Tune the ferrite loop to a signal at 4000 kHz with C1A+B; put switch SW to ON and, with the phasing resistor at around midposition, slide L3 along the short ferrite rod (see Figure 6) until resonance is found, then seal L3 to the rod with hot candle wax. The sensing rod circuit should now operate between 4000 and 1600 kHz. It can be extended down frequency by connecting C3 in parallel with C2.

Operation

In operation with the ferrite loop used with the sensing circuit in the OFF position, tune C1A + B to the required frequency. Maximum signal is *broadside to the ferrite loop*, and minimum signal is on the rod ends. The nulling is extremely sharp and eliminates most QRM and QRN. The chassis bottom plate must be fitted for full screening. With a high RF gain receiver a preamplifier has not been necessary but, if required, a wideband RF amplifier circuit

board can be fitted underchassis.

With sharp nulling and a figure-eight polar diagram, it is possible that a station on the 180 degree reciprocal bearing could interfere with the wanted station. If this occurs, the sensing switch can be switched on to change the polar diagram to the cardioid pattern (Figure 2B), with a large single forward lobe, and the null now at the back. With C2L3 tuned to resonance and the telescopic whip 17" long, the phasing resistor should be adjusted so that signals from the sensing rod and ferrite are equal in amplitude. In practice, the cardioid null is not as pronounced as that shown in Figure 2A, but the forward lobe is larger. So, in practice, with a flick of the switch it is possible to change from one polar diagram to the other.

Introduction of the sensing rod also enables the user to find the directional bearing of a station, assuming a simple turntable is placed under the unit. It will also indicate the bearing of persistent QRN.

Parts List

Qty.	Description
2	Ferrite rods, 7-1/2" long x 1/2" diameter; type R61-050-750 (Available from Amidon Associates Inc., 2216 East Gladwick Street, Dominique Hills CA 90220 USA
1	2-gang 500 + 500 pF variable capacitor with knob
1	2-gang 410 + 182 pF variable capacitor or single-gang 400 pF (such as 500 pF with series capacitor) insulated coupler shaft and knob
1	10k ohm carbon track variable resistor with knob
1	1-1/2"-long x 3/8"-diameter ferrite rod (cut some BC receiver-type rod)
1	1-1/2" x 1/4" o.d. paxolin or plastic tubing
1	Aluminum chassis with bottom plate, 8" x 6" x 2-1/2"
1	20"-long telescopic antenna whip
1	1/4" (6 mm) mono jack plug with plastic (not metal) sleeve
1	1/4" mono jack socket
1	Mini ON/OFF toggle switch
1	Chassis mounting coaxial socket plus 36" maximum RG58 feedline with suitable plugs
1	16" length of 7/8" o.d. UPVC plumbing piping with two standoff wall clips
Wood	1-3/4" x 3/4", one piece 6" long and one piece 7/8" long 1-3/4" x 3/4" x 3/8" hardwood
Wire	22 gauge enamel copper wire for L3 PVC 10/0.1mm connection wire 0.9mm overall o.d. for L1
Sundries	1"-wide masking tape; cyanuacrylate adhesive (Superglue or similar); nuts, bolts, washers and roundhead brass wood screws

Low-Cost Transmission Lines

What you don't know can cost you.

by Frank Kamp K5DKZ

At first glance, this title seems to contain a conflict of terms. Transmission lines are the more significant part of the cost in most simple antenna systems. We all like the convenience of using coax, even if it is not the most economical solution. After all, what else is there? Open-wire line and twin lead require an antenna tuner. That at least gives us a choice, but the expense is still there, either in the cost of coax or the purchase of an antenna tuner. Bargain-style coax is not a good solution. It is usually either of very questionable quality and has poor shielding, or it's embrittled with age.

For medium and high power use, RG8 or equivalent is the most logical choice in coax. It's heavy enough to handle the power. It's also heavy enough to require some pretty stout wire and supports if used in a flat-topped dipole installation with no center support. Then, if you want to add a balun at the antenna feed point, you compound the weight problem.

Twin lead is the most obvious solution. It can be matched to a short length of coax through a 4:1 balun for easy routing to the shack. That helps the situation somewhat, but what if our antenna does not match 300 ohms and we don't want to use a balun at the elevated feed point? We could always construct the dipole from twin lead, giving us our impedance match and broadband performance at the same time. That solution also has its drawbacks. Twin lead does not weather as well as simple wire and coax. The cheaper, receiving type of twin lead may not handle the full legal power limit.

The variations and permutations of this decision-making process seem endless because there are so many variables involved. What we really need here is some magic do-everything transmission line that can provide more options to deal with these variables. Chief among these options would be a line made from inexpensive materials that can be used without worry regarding impedance match to the antenna. Such a device does exist; it can be made from inexpensive materials, or from almost any type of wire or cable. You could even use that 1,000-foot roll of lamp cord that was such an irresistible bargain two years ago.

An electrical half-wave section of transmission line has the unique property of mirroring impedance from one end to the other. For all practical purposes, the electrical properties seen at one end are the same as at the other end. The reaction of most people when they are first introduced to this well-known fact is "So what?" The conventional use of transmission lines takes advantage of the fact that such a line has a characteristic surge impedance for *any* physical length. All that is needed is termination in that characteristic impedance at both ends. However, the mirroring ability of a half-wave transmission line becomes infinitely more useful when we realize that it has nothing to do with the surge impedance of the line. This means that we can use virtually any two conductor lines available to physically bring the electrical equivalent of the antenna feed point down to ground level where we can more effectively deal with our matching problem.

The Procedure

The key here is to ensure that the nondescript line is equal to a multiple of *electrical* half waves in length. The downside is that this trick will only work on exact multiples of a fundamental frequency. A line cut for 3.5 MHz will also work on 7.0 MHz, 14.0 MHz, and 28.0 MHz. A line cut for 3.9 MHz will work best on 7.8 MHz, 15.6 MHz, and 31.2 MHz. As you can see, multiband operation using this concept is somewhat limited unless we use an antenna tuner. The other problem is determining what physical length of cable corresponds to an electrical half wave at your chosen frequency.

The electrical half-wave length of any transmission line will *always* be physically shorter than the length calculated from the formula: half-wavelength in feet = 468/frequency, in MHz. The ratio between its shorter physical length and the length from the formula is known as the velocity factor of the line. Velocity factors for various popular transmission lines can be found in *The ARRL Handbook*. You won't find lamp cord listed there.

You can calculate the velocity factor of any line with nothing more than your station equipment using the following procedure (use a frequency in the 10 meter band to avoid wasting any more of your valuable lamp cord than necessary): From the formula above, calculate the half wavelength in feet for the frequency you are using. Cut a section of lamp cord to this length. Connect the output of your transmitter to a dummy load using a short length of coax in series with your SWR meter. Tune up on frequency using as little power as possible. Note and record the SWR into the dummy load—it should be very close to 1 to 1. If it isn't, check your hookup and verify that your dummy load is indeed 50 to 75 ohms. Now replace the short length of coax with your lamp cord transmission line (Figure 1). Do not readjust your transmitter except for drive to the final, if needed. Apply power and take an SWR reading—it will probably be higher than 1 to 1. Trim a few inches off the lamp cord section and try again. Continue this until you get the lowest possible SWR—it should be close to what you experienced with the dummy load connected through the coax. Measure the final length of the lamp cord and divide it by its original length. The result will be less than one and will represent the velocity factor of your line cord. Now you can use that value to calculate the physical length of lamp cord required to give an electrical half wavelength on any frequency.

Qualifications

You might be tempted to do this test at 2 meters if you have the equipment. That would waste even less cable, but it may also give you bogus information that will not scale down to HF frequencies. The formula we used is only good for frequencies up to 30 MHz.

Of course, you are not restricted to using lamp cord. Almost any line having two conductors will work, as long as its physical makeup is uniform throughout its length. For instance, using alternate sections of twin lead and lamp cord where each section is less than an electrical half wavelength might not be a good idea. The surge impedance of the line is not a factor, but I don't think that allows it to be a variable through its electrical half wavelength. You could even use a twisted pair, as long as the pitch of the twist is uniform throughout its length. We also need to exercise a little common sense here. You can't bury a section of lamp cord in the ground like you would coax. A twisted pair made from #24 enameled wire might work for a receiving application, but I wouldn't use it for transmitting.

Another example application of this principle is my recent experience with a dual dipole phased array for 40 meters. This is an active array; each leg of each dipole receives power. Some sort of balanced feed was required, but I wanted to use shielded cable to reduce noise pickup on the vertical sections of the transmission lines. I ended up using four electrical half-wave sections of surplus RG62 coax, two sections per dipole. The center conductors of the coax were connected to the dipole legs. The shield of the coax was tied together at both ends of the transmission line and grounded at the phasing network located in a box below the array. 73

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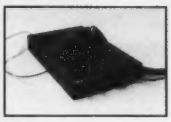

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? ...No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-50 kit (6 Meters) $149.95
FX-146 kit (2 Meters).....$149.95
FX-223 kit (1 1/4 Meters).....$149.95
FX-440 kit (3/4 Meters).....$169.96
CFX matching case set.....$29.95
FXM-1, ICOM/Yaesu style speaker mike $29.95

QRP AMPLIFIER

For a slick little QRP boost, use one of the 20 Watt amplifiers. Needs only 1/2-2 watts of drive for full output, linear for SSB, AM or CW operation, power MOSFETs for high effiecency and multistage low pass filter for a clean signal. Built-in T/R relay for automatic switching, runs on 12-15 VDC at 2-4 amps. Add our matching case set for a complete station look.

Your choice of bands $49.95
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CQAMP Matching case set.....$14.95

2WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantastic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10.000 µV output levels • High receive sensitivity, less than 5 µV • 100 kHz to 999.9995 MHz • Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder • 1 KHz and external modulation.

COM-3 2 Way Radio Service Monitor $2995.00

2 MTR & 220 BOOSTER AMPS

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $99.95

PA-20 220 MHz POWER BOOSTER (8 X power gain) Fully wired & tested.....$99.95

SX-20 20 METER SSB/CW TRANSCEIVER

Finally, a handy go anywhere rig that puts the fun back into ham radio. How about the DDS synthesizer that tunes in 10 Hz steps with exceptionally low noise for weak signal reception. Or, how about the built-in Iambic CW keyer that has a digital readout of your CW speed. Perky 10 watt RF output (that's only 11/2S units below a 100 watt rig!) can be tuned down for true QRP operation. Included with the SX-20 is the hand mike with handy UP/DOWN buttons for remote tuning of the rig while driving — or biking — or boating. Available in both fully assembled and fun to build kit form, you'll find that the SX-20 will become your favorite rig.

SX-20 20 meter SSB/CW Transceiver, fully wired, 1 yr. warranty $429.95
SX-20 20 meter SSB/CW Transceiver Kit Form.....$349.95
Optional CW Audio Filter SXCWN WT .....$49.95 Kit $39.95

FOXHUNT HEADQUARTERS

Locate hidden or unknown transmitters fast. The Foxhound direction finder connects to the antenna and speaker jack on any radio receiver, AM or FM from 1 MHz to 1 GHz. The antenna (a pair of dipole telescopic whips) is rotated until the Null meter shows a minimum. A pair of LEDs indicate to turn Left or Right. The Foxhound is ideal to use with a walkie-talkie. if you wish to transmit, go ahead, a built-in T/R switch senses any transmitted RF and switches itself out of circuit while you talk. It doesn't get any easier than this! We provide all parts except for a few feet of 1/2 inch PVC pipe avialable at any hardwar e store for a dollar or two. Add our matching case set for a complete finished unit. Be the one with the answers, win those transmitter hunts and track down those jammers, you'll do it all with your Foxhound.

Add some fun to your club events by having a transmitter hunt! Foxhunting is a craze sweeping the nation, but many clubs are missing out on the action because they lack the expertise or time to develop their own foxhunt transmitter. We set one of our most devious and sneaky engineers to the task of designing an easy to build and use, yet highly capable Foxhunt transmitter. A snazzy microprocessor controller has both preset and programmable transmission characteristics allowing you to easily set the difficulty level from "beginner" to "know-it-all"! The SlyFox, FHT-1, is crystal controlled in the 2 meter band (crystal for 146.52 included) with a power output of 5 watts that is adjustable by the controller.The transmitter is programmed to ID in CW or add our voice option if you really want to aggravate the troops - "Ha ha, you can't find me!" Join the fun, get rid of those stuffy old meetings and picnics. have a foxhunt!

DF-1 Foxhound direction finder kit .....$59.95 CDF Matching case set for DF-1 ....$14.95
FHT-1 SlyFox Foxhunt transmitter kit .$129.95 FHID-1 Voice ID option.....$29.95
CFHT Heavy duty metal matching case set for FH T-1 .....$29.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly NO TUNING'. Includes FREE disk software, PC Board and Full Documentation. Kit form.

P-64A.....$59.95 P-IBM .....$59.95 CASE CPK.....$12.95

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit .. $34.95
CFM Case,whip ant set..... $14.95

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit .$39.95
CaSD matching case set.....$14.95
SS-70WT Assembled
SS-70 and case set $79.95

Miniature SPEAKER-MIKE

Fits Icom, Yaesu, Alinco, Ramsey and Radio Shack rigs! Looking for a handy little speaker-mike to compliment your FX transceiver or other ICOM style handie-talkie? The Ramsey SM-1 speaker-mike is a beauty. It's only 1 1/2" wide by 2 1/2 inches high and has a handy clip on the back so you can easily clip it to your lapel or shirt. Its small internal speaker isn't going to break any eardrums but is very clear and has plenty of pop to be heard when worn. There's even a jack on the mike so when you plug it in, you still have the use of the speaker jack from your radio. Fits all Radio Shack, ICOM, Yaesu, Alinco and Ramsey rigs.

SM-7 Mini-Speaker mike,
Fully assembled.....$24.95

CW KEYER

Send perfect CW. Microprocessor keyer features 4 programmable memories of up to 26 words each, Iambic keying, dot-dash memory, variable speed from 3-60 WPM, adjustable sidetone, keying to any rig and fully RFI proof. EAROM memory keeps messages up to 100 years - you'll go silent before the key! Includes built-in touch paddles or use your own. Easy assembly and matching case set available for a nice station look.

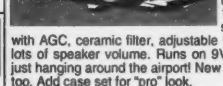
CW-700 Micro keyer kit.....$69.95 MK Matching case set..... $14.95
CW-700WT Assembled CW-700and case $119.95

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7Kit.....$28.95 Matching case & knobset, CAA ..$14.95

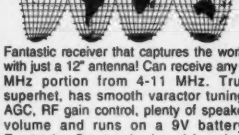
AIRCRAFT RECEIVER



Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit $29.95
Matching case set, CAR $14.95

SHORTWAVE RECEIVER



Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1.....$29.95
Shortwave converter kit, SC1.....$27.95
Matching case set for SR1, CSR .. $14.95
Matching case set for SCI, CSC ...$14.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit.....$34.95
TR-1, RF sensed T-R relay kit.....$14.95

MORE KITS NEXT MONTH'S ISSUE

MINI KITS

Ramsey carries a complete line of low cost, easy to build, easy to use functional kits that can be used alone or as building blocks in larger more complex designs. Mini-kits include audio amps, tone decoders, VOX switches, timers, audio alarms, noise-makers and even shocking kits! Call for our free catalogue!

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

FM-5 Micro mike kit.....$19.95

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit $19.95

DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit $49.95
CDN Matching case set.....$14.95
DN-1WT Fully assembled Dr. Ni-Cad with case.....$89.95

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RAMSEY ELECTRONICS, INC 793 CANNING PARKWAY VICTOR NY 14564

CIRCLE 34 ON READER SEVICE CARD

73 Review

by Bill Clarke WA4BLC

The HOFI Antenna Switch

Quality at every turn.

Electronic Switch Co., Inc.
4343 Shallowford Road, Suite E-6
Marietta GA 30062
Telephone: (404) 518-4634
Price Class: HOFI 605—$94.95;
lightning surge protector—starts at $59.

Like most hams, I switch from one antenna to another on a regular basis. Generally, my antenna selections are made for band-change reasons; however, I also use switching as a means of comparing one antenna to another.

Over the past 25 years I have gone through quite a few antenna switches. Some were made of cast white metal, while others were wafers in project boxes. A few were of fair quality and lasted for several years. However, most just couldn't stand up to the constant use.

Among the failures, I found that the contacts would wear thin or the shafts became loose in their housings. All the switches had a common thread: poor physical construction. Unfortunately, they were all expensive.

I am a believer in paying for quality. If the price is high, the quality should be equally as high. The general appearance of the product should reek of quality, the operation should be smooth, and the product should last indefinitely.

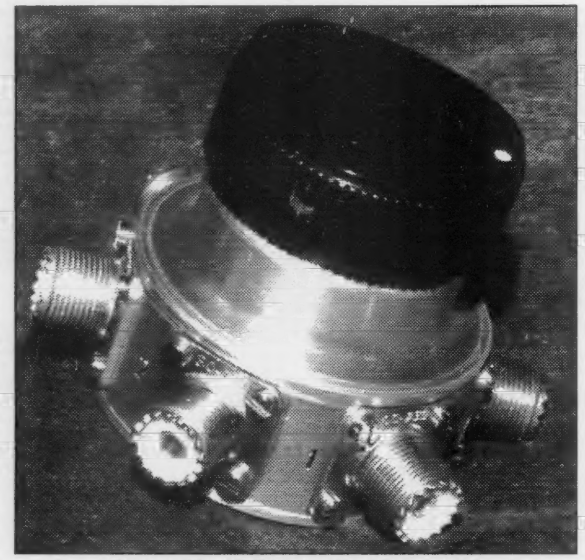

Photo A. The HOFI Model 605 antenna switch.

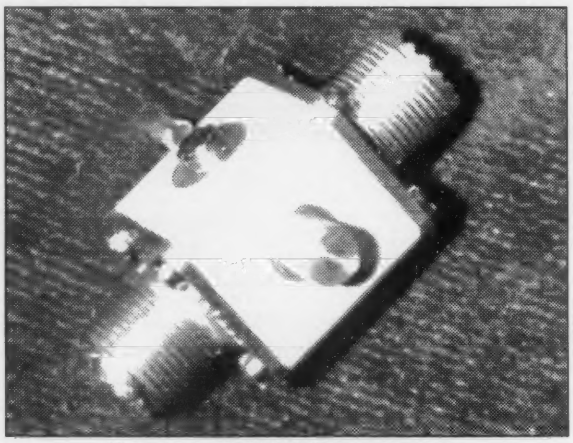

Photo B. The HOFI lightning surge protector.

HOFI RF Switches

The HOFI manual coax antenna switch, called a "hoscha," is constructed of aluminum and stainless steel. It is round, with a large knob, and has connections for five antennas. This one reeks of quality.

The switching action of the hoscha is smooth and very positive, yet requires little effort. As it is a new product to me, I don't know if it will last indefinitely; however, after disassembly and examination, I think it will be around for a long time with no failures. In other words, the MTBF (mean time between failure) will be measured in large increments of years.

HOFI switches are built in Germany, a country famous for its engineering prowess. The company produces a number of different switch configurations, including remotely-controlled antenna switches. This review covers only the manual version.

Construction

The manual series of HOFI antenna switches is available with UHF or N connectors—straight from the switch or at right angles (a yet-to-be-released model will have the connectors exiting directly from the rear plate of the switch):

Model 605:	UHF connectors
Model 2005:	N connectors
Model 606:	UHF right-angle connectors
Model 2006:	N right-angle connectors

The outer shell of the switch is formed by an aluminum drum with a flat rear cover and a spun/raised front cover containing the switching shaft. The shell thickness is nearly 3/16". The knob is over 2" in diameter. The six SO-239s are fastened to the drum with machine screws. The rear plate is drilled and tapped for mounting purposes.

The inner workings of the switch consist of self-cleaning double-knife type contacts. This type of construction provides long-term consistent operation, even at high-power operations. A positive detent provides locking action.

Operation

The switch tested, Model 605, was used to select between five antenna, ground, and dummy load combinations. At no time were any problems noted; however, it is fair to say that it could take years for problems to appear.

I should note that the switch leaves unselected antennas open, rather than switching to ground. Some manufacturers do switch all unselected antennas to ground. When switched to position "0," no antenna is selected and all lines are open. I view this as a "non-problem" in that a direct lightning strike will destroy *any* type of switch. Lightning protection cannot be satisfactorily accomplished by merely switching to ground (or grounding an antenna through a switch).

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Lightning Protection

Included with the review unit HOFI antenna switch was a small (about 1" square) lightning surge protector with an SO-239 mounted on each end. On one side is a removable metal plug that allows replacement of the gas-discharge tube, and on another is a lug for connection of the case to DC ground. The basic heavy-duty construction is similar to the antenna switch. The surge protectors are available for power ranges from 500 watts to 7 kW.

Note that the surge protector is not included when you buy the switch; it is a separate item.

Availability

HOFI antenna switches and surge protectors are available from Electronic Switch Co., Inc., at the address above, and through many well-stocked amateur radio supply stores.

Specifications

Impedance	50 ohms	
SWR	Less than 1.06:1	
Insertion Loss	Less than 0.04 dB	
Upper Frequency Limit	200 MHz (500 MHz with N-connectors)	
Power Limits	Below 30 MHz	3,000 watts
	2 meters	1,000 watts (1,200 watts with N-connectors)
	440 MHz	700 watts with N-connectors
Isolation	Below 30 MHz	50 dB
	2 meters	40 dB
	440 MHz	30 dB

73 Review

Number 8 on your Feedback card

by Peter J. Bertini KIZJH

Computer Automation Technology
4631 N.W. 31st Avenue, Suite 142
Fort Lauderdale FL 33309
Telephone: (305) 978-6171
Price Class: CAT 1000—$679;
CAT 300—$299;
CAT 300 Deluxe—$399.

Computer Automation Technology's CAT 1000 and CAT 300 Repeater Controllers

An outstanding value in a crowded marketplace.

When my radio club, the Mt. Tom Amateur Repeater Assn. Inc., decided to upgrade our repeaters to newer controllers, I embarked on a search for the best value and best controller for our needs. I made several inquiries via packet BBSs throughout the USA, seeking comments from other repeater groups, and was surprised at the favorable comments and fierce loyalty of the CAT controller owners, a controller which had previously escaped my notice.

A Different Breed of CAT

What makes the CAT controller stand out from others in a saturated and highly competitive market? Many things. First, price: The CAT 1000 is the most powerful controller in any price class. Its design is a year old, and thus it uses the latest in technology. We have found the people behind the CAT products to be extremely attentive to our needs and problems. Software upgrades, which simply require that you swap out an EPROM chip on the controller with the latest revision, are periodically released—usually without charge to CAT owners.

I had the opportunity to beta test a CAT 300, and this review will cover that controller as well. But, since the CAT 300 is a scaled version of the CAT 1000, I will deal with the CAT 1000 first, and then briefly cover the differences between the CAT 300 and CAT 1000 controllers. It would be almost impossible to cover in great detail what these controllers can do, so this review will be limited to a brief synopsis of their main features.

Control Channels

The main control functions of the CAT 1000 are broken down into eight zones with eight control channels in each zone, for a total of 64 off/on commands. The zones break down the commands into logical groups of eight commands each, dealing with autopatch, repeater, etc., control.

Voice Messages

A 40-position voice message table permits storage of synthesized voice messages constructed from the 475 word and sound effect vocabulary. Time variable selections are also offered. Up to 31 "words" from the vocabulary list may be stored in each table location. The digitized voice vocabulary uses the latest Texas Instruments voice set, and sounds noticeably better than the first generation TI version used by many other makes of controllers. Digital Voice Recorder (DVR) track selections may be used in the voice message coding, permitting voice tracks to be intermixed with the synthesized messages. More on the optional DVR unit later. Included in the 475-word vocabulary table are also codes for courtesy tones, DTMF tones, the 16 DVR tracks, CW IDs, and control of the eight user input and outputs provided on the CAT 1000.

The Scheduler Is Included

A 60-position scheduler is included. The scheduler may be set to control various repeater functions at preset hours, days and months, and may be preprogrammed for special events a year in advance. Besides being able to control the zone channels, the scheduler can fire selected voice messages, DVR tracks, macro commands (more on these later), paging tone groups made up from Motorola two-tone sequential paging tones, and DTMF tones groups from respective 40-position tables.

Software pointers enable the programmer to select whether scheduled events (including macro or memory file loads, etc.) occur based on repeater usage. For example, you may elect to have a scheduled hourly—but lengthy—club bulletin skipped over if the scheduler command is set up to do so when the repeater is in use. On the other hand, a scheduled "must go!" net announcement, macro or memory file swap maybe programmed to occur regardless of whether the repeater is in use.

Macro Commands Link Operations

The macro commands allow several operations to be combined together. Each of the 40 table positions is given a control number (up to seven digits) that can be initiated either from the repeater or control receiver input via DTMF commands, or the macro may be initiated by the scheduler to perform a series of tasks at certain times, or by the action of one of the eight user inputs. Up to 10 macros may be included in a macro string, including the ability to cascade macros by calling another macro set as the last command.

Control Security

The CAT 1000 employs two DTMF decoders. Control may be done via the repeater input, but one decoder is used only for control commands entered via either the UHF control receiver or telephone. Telephone control takes priority over the UHF control input. All of the user functions, and control operator passwords, macro control codes, autopatch codes, etc., are easily changed and may be set up to seven digits in length.

A control operator password is needed to change or to read back the status of the channels in any of the eight zones. An unlock code is needed to "enter" the controller to do more involved programming, such as changing passwords, patch codes, or programming the macro, scheduler, autopatch, voice message, DVR or other tables.

Control operators can access the CAT via telephone, the repeater input, or through a UHF receiver link for DTMF programming. A 300 baud onboard modem allows accessing the controller through your home computer for single-line command edits. Using the optional editor program ($39), the complete set of eight DOS files can be edited at home and

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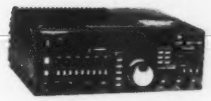

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"TS-50S", TS450S/AT, R-5000, TS-850S, TM 241/A/441A, TR-751A, Kenwood Service Repair, TS140S, TS690S, RZ-1, TS-790A, TS950SD, TH-78A, TH28/48A, TM-941A, TM-741A, TM-732A, TM-641A, TM-742A.

MARINE RADIOS
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AVIATION PORTABLE ICOM A-21
MOTOROLA MARINE KING KX 99

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ICOM: R-1, R100, R71A, R72A, R7000, R7100, R9000
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FT411E-811-911	IC02AT/2SRA
FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

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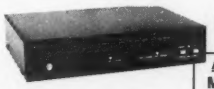

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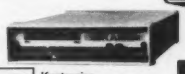

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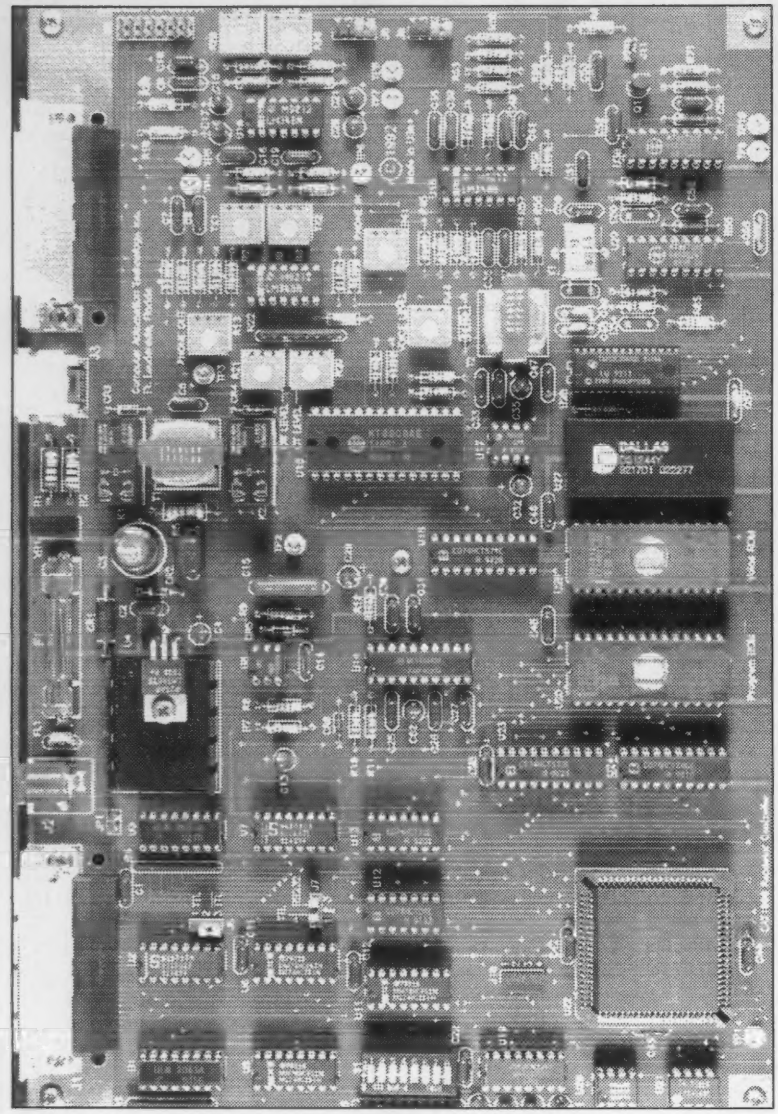

Photo A. The CAT 1000 repeater controller board.

uploaded (or downloaded from) to the CAT 1000. Modem access is password-protected. An on-site 4800 baud RS232 jack is provided. All CAT 1000 RAM memory is stored in a nonvolatile Dallas time and 64k memory chip.

Control operators, besides having the ability to easily edit the scheduler, macro and other tables, can also check the contents or status of any of the tables, timers, zone channels, auto dialer numbers, etc. in a vocalized format!

Memory Files

An extremely powerful ability of the CAT 1000 is the ability to recall any of eight preprogrammed memory files into active memory. The memory file loaded into active memory can be easily changed and restored in its new configuration. Memory files maybe recalled by repeater users, if so permitted to do so, or via scheduler or macro command strings. New memory files can be created from scratch in active memory, and then stored to the appropriate memory file. Each memory file can give the repeater an entirely new personality—each memory file contains a unique setup for the 64 control channels, 18 repeater timer values, and the 25 control codes governing the autopatch, control operator codes, speed and emergency telephone dialers. The "loading" of a memory file to active memory is completely transparent to the repeater users when it occurs.

Courtesy Tones

Courtesy tones are made up of from one to three sequential tones. The frequency, duration and spacing of the tones are selectable, and you may store the values for 10 different courtesy tones in a special table. Each of the 10 table positions is assigned a value in the 475 "word" vocabulary listing. The link or remote base COR has its own unique courtesy tone.

IDs

Two CW IDs are included. One will automatically execute if someone attempts to talk over one of the synthesized voice ID messages. The CW IDs may be selected as the primary IDs if so desired. Six different voice IDs may be preset and stored in voice message tables one through six. DVR tracks may be used as voice IDs in any of the six voice message slots allocated for these positions.

The Autopatch

The autopatch may be run open, or closed and protected with up to a seven-digit access code. A 20-position phone number lockout table is provided, and with the * wildcard all four- and three-digit numbers (***, ****) may be locked out. Another 20-position area code lockout table is provided, and again the * wild card may be used to expand the lockout features. For instance, entering 9** in this table would lock out all area codes beginning with the digit nine. The autopatch will vocalize the phone number entered in a manual autopatch operation, unless the feature is disabled.

Up to 10 emergency speed-dial numbers may be stored, and up to 300 membership phone numbers maybe stored in three groups of memory. Each memory dialing position also can be used to store and vocalize what is being autodialed; for example, the controller would say "autopatch, K1ZJH" if that information was stored along with my phone number in memory. Each of the three groups of 100 sets of telephone memory, and access to the emergency speed dial, can be protected by unique access codes. Reverse autopatch is available, last number redial and DTMF regenerated dialing or pulse dialing is also available.

User Inputs and Outputs

The CAT 1000 has eight inputs and outputs. The inputs look for a positive-going transition, and may be programmed to execute macros, voice messages, file loads, user outputs, or other controller actions when activated. The input signal levels are TTL, CMOS or supply voltage compatible. Eight open collector outputs are provided to control on-site equipment.

Other Features

DTMF muting, DTMF windows, DTMF pad test, time of day request and grandfather clock, and DTMF paging regeneration are other features of the CAT 1000. The repeater may be put into either/or DTMF or CTCSS access, with a programmable window for open access once either is detected. The ARRL LiTZ emergency alert is supported.

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It's SIMPLE
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The DVR

The digital voice recorder has 16 soft-partitioned channels with up to two minutes of total recording time and is an option. Serial card #2 must be installed on the CAT 1000 for the DVR option. The serial card costs $59, the Ming DVR unit is $99, and the interconnecting cable is $20. Serial card 2 will supply eight additional user outputs.

Other Options

C3I, Inc. makes accessories that support the CAT controllers. One is an audio delay board (Model ADB, $94.95) that will delay the incoming receiver audio up to 150 mS. This will mask the first blip of a DTMF tone, and also eliminates the repeater squelch tail noise burst. Another C3I product is their APM board, an audio processor which sells for $43.25. The APM board allows the repeater operator to tailor the repeater audio response by either enhancing or reducing the high and low frequency passbands. C3I also provides optional enclosures for the CAT 1000. These items are available factory-direct.

Remote Base Operation and Linking

The CAT 1000 will fully support multiple radio VHF/UHF remote bases or links through a Doug Hall interface. Link serial tuning is available through serial card #1 when installed. Forty preset link frequencies can be stored in memory. Frequencies may be stored in BCD format. The CAT 1000 is also an HF remote base controller, and will directly interface to and provide full control over either the Kenwood TS440 or Yaesu 767GX HF transceivers.

CAT 1000 Manual

The CAT 1000 manual is complete, although the beginning user will most likely be lost trying to figure out all the features of his new controller. The problem is that the CAT 1000 is so powerful it is impossible to fully learn it without playing with it for a few weeks and learning as you go. There are usually several ways one can program the controller to do various tasks, due to the programming power offered by the scheduler and macro commands. Programming examples given in the manual are complete, but in my opinion a training section is badly needed to help one get started. However, should problems or questions arise, the factory telephone support is without equal.

Interfacing the CAT controllers to an existing repeater is a simple and painless task. All external connections to the outside world are done through 25-pin connectors, which include internal EMI filtering. Complete turnkey repeater systems incorporating the CAT controllers are available from Maggiore Electronic Labs (see the sidebar).

CAT 300 vs. CAT 1000

The biggest difference between the models is the ability to support links, cross-band repeaters or remote base operation. The CAT 300 does not support these features; for a budget-minded club not needing them, it is a top-notch choice. The base price of the CAT 300 controller is $299. With the optional clock and scheduler the CAT 300 Deluxe costs an additional $99. There is no modem, RS232 jack, or DTMF or paging tones available in the CAT 300. But, the CAT 300 does include a full-featured autopatch with 100 speed dial and five emergency dial locations. 73

Peripheral CAT Support Products:

C3I, Inc.
406 North Pitt Street
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(703) 684-1382

Turnkey Repeater Systems Using the CAT Controllers:

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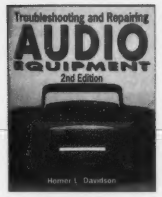

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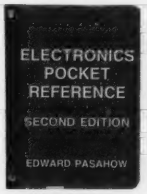

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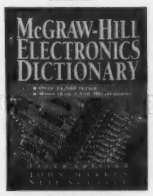

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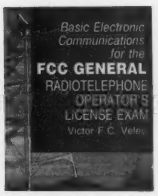

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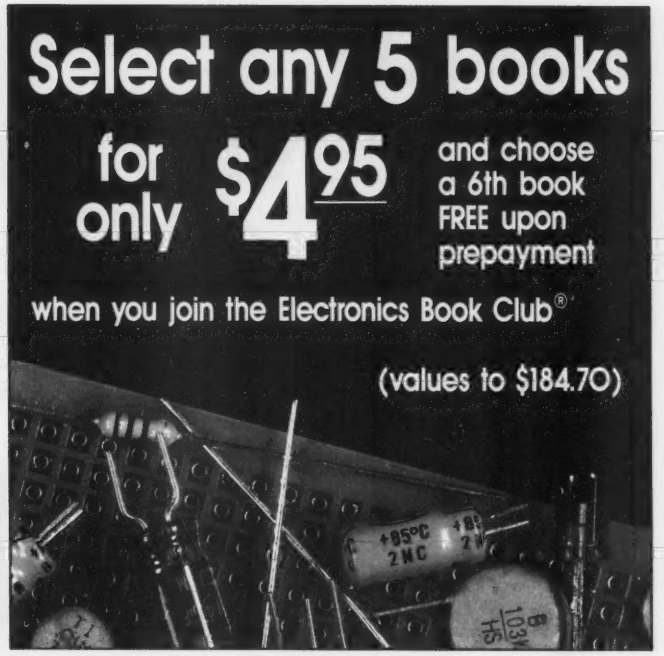

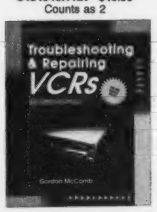

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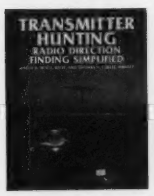

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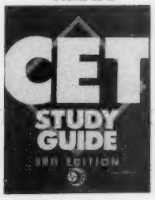

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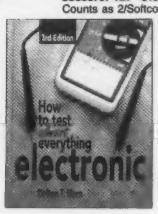

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73 Review

by Michael Jay Geier KB1UM

The Yaesu FT-11R Miniature HT

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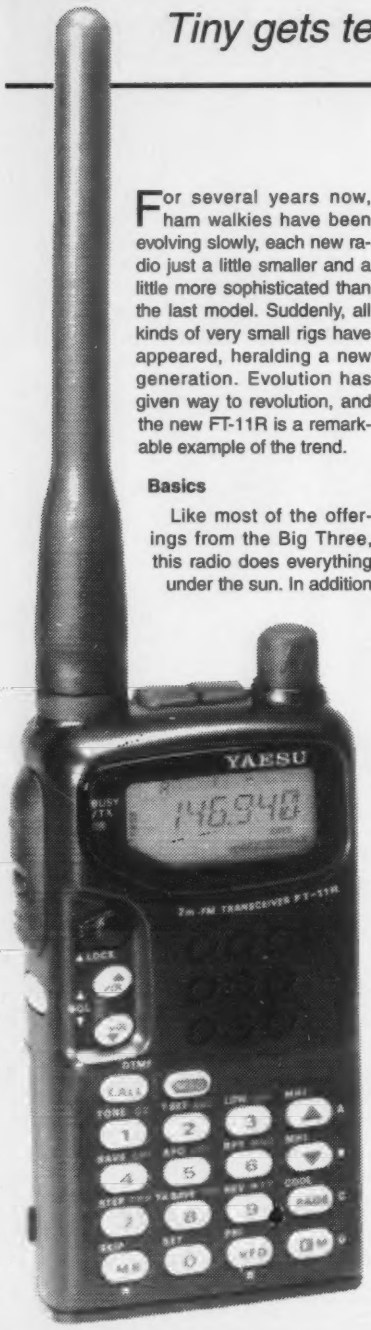

For several years now, ham walkies have been evolving slowly, each new radio just a little smaller and a little more sophisticated than the last model. Suddenly, all kinds of very small rigs have appeared, heralding a new generation. Evolution has given way to revolution, and the new FT-11R is a remarkable example of the trend.

Basics

Like most of the offerings from the Big Three, this radio does everything under the sun. In addition to the now-standard autodialer memories, generous memory capacity (150 of them!), CTCSS encode (decode is optional) and digital paging features, this diminutive pocketful incorporates a few new goodies: alphanumeric labels for each memory, message paging, and knobless volume and squelch adjustment.

With the supplied 4.8-volt battery, power output is 1.5 watts, which is less than you usually get with full-sized HTs but in line with many other miniature rigs. It should be enough for most repeater operations. But, if you need more power, higher-voltage batteries will get you all the way up to 5 watts out, which occurs at 9.6 volts DC input. And, you can get an AA-cell holder, so you'll never be out of power in a pinch. Naturally, the rig will get bigger with a larger pack hanging out the bottom. Although the radio is rated up to 12 volts, that really means 12 volts in this case, not 13.8 to 15 as is commonly found with car power. Consequently, there is no direct DC input jack; a special adapter is required to run this radio from your car's electrical system or an external supply. The adapter is pretty slick, though—it's a cradle which includes an 11-volt regulator and a cooling fan. Most of today's HTs will put out 5 watts, but they'll get so hot you can't hold them. The fan should keep this one a lot cooler. By the way, most of the new mini-rigs are limited on how high an input voltage they can accept, and few can take direct car power. Like this HT, they use power FET transmit final amp modules, which are very efficient at low voltages but just can't tolerate the higher voltages.

This baby is small! At about 4" x 2-1/4" x 1", the whole thing fits into the palm of your hand. Many of the small radios increase their total internal volume by being somewhat thick. Not this one; its one inch is about the slimmest depth I've ever seen on any HT.

The front of the rig has a fairly large display, a BUSY/TX LED, an 18-button keypad, and two more buttons for controlling the volume and squelch. All 20 of the buttons are large and have good tactile feedback, and they're all backlit by green LEDs, along with the display. Also, there's a lever which lets you lock the rig's controls to prevent accidental operation. On the side are the usual rubberized PTT, lamp and monitor buttons. The power on/off button is electronic and is located there, too. On top are the antenna connector, the mike and earphone jacks, and the dial knob. That knob is the only one on the entire rig!

The antenna is exactly the same length as the radio, which is convenient for stuffing the whole works into a little calculator case or something similar. The duck is very stiff, though. But it works fine.

The included 600-mAh nickel-cad pack fits very securely on the back of the radio, which is a stark contrast to some of the other new mini-rigs with "nesting"-style batteries. There's no way you could accidentally cause this one to fall off. In fact, even deliberately pulling it off requires some effort.

The Goodies

The most impressive new feature is the memory capacity. In normal, numeric readout mode, you get 150 memories, which is great because this radio makes a dandy VHF scanner, too. Actually, as delivered it only covers the 2 meter ham band. But, with a simple series of button presses, which are described in the manual, coverage increases quite a bit, to 110-180 MHz receive, with an AM detector automatically engaged below 136 MHz for easy listening to the aircraft band. Transmit is still limited to 144-148 MHz, though. Naturally, MARS/CAP mods are available for permit holders.

You can also choose alphanumeric mode, which lets you label each memory with a six-character name. In this mode, memory capacity is reduced to 75, but who really needs more than that on a single-band HT? The alpha mode is great if you live near lots of repeaters or travel a lot. No longer do you need to remember that 145.470 is downtown and 146.850 is west. Just call them DWNTWN and WEST!

Along with the now-common but rarely-used DTMF squelch, this radio offers message paging. In this mode, you can send and receive up to 10 sets of six-character mes-

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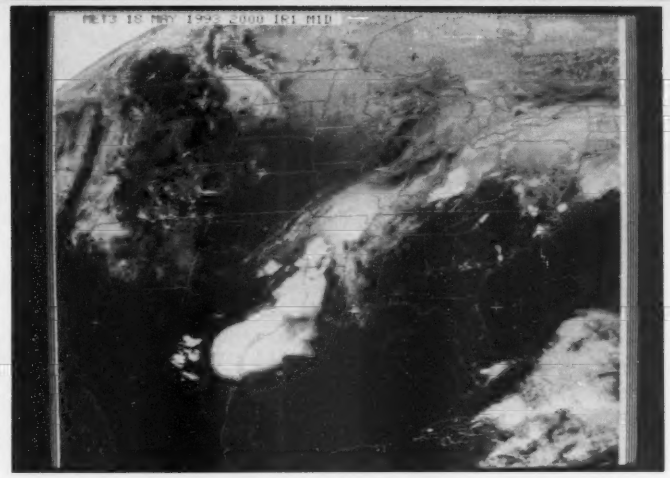

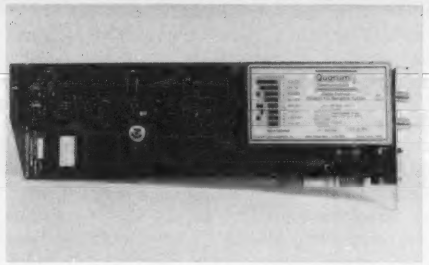

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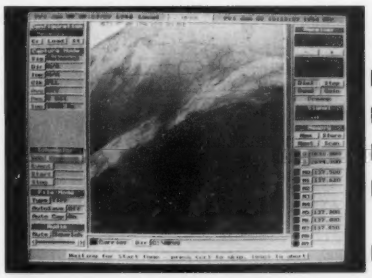

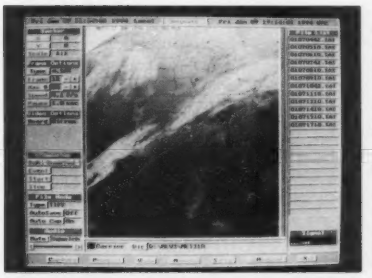

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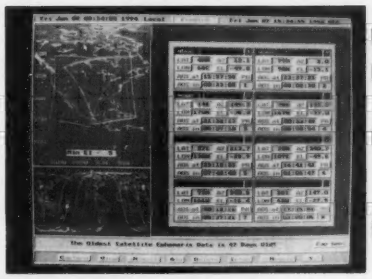
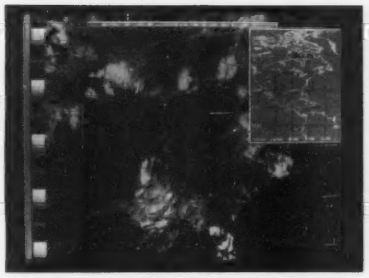
- *NOAA / Meteor APT Reception*
- *HF Nafax Reception*
- *Dual RF ports for geosync and polar reception under software control*
- *Integrated preamp and down converter power inserters*
- *50 user definable configurations*
- *Software controlled receiver with 2 UHF, 10 VHF memories and scan*
- *On board audio amplifier and speaker with software controlled volume, squelch and mute*
- *Automatic Unattended Animation works continuously*
- *8 bit data for up to 256 gray levels*
- *View at up to 1280 x 1024 256 color*
- *Use TIFF, GIF or PCX file formats and convert to BMP, JPEG, EPS and binary*
- *Contrast, Brightness, 3D effect, Sharpen, Smooth, Noise, Histograms and other image processing*
- *Integrated Satellite visibility prediction with automatic capture for up to 8 satellites simultaneously*
- *Automatic time and ephemeris stamping for navigation*
- *2 7 day programmable schedulers*
- *Automatic digital gain lock in ALL modes, PLL clocking*
- *Ephemeris based NOAA APT navigation with geo-political and Lat-Lon overlays*
- *NOAA Tools show satellite path, Lat-Lon of cursor, distance and bearing to reference point*
- *Automatic Temperature Calibration*
- *Color Palettes and NOAA curves*





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CIRCLE 257 ON READER SERVICE CARD

sages. You can also store up to 10 of these for future transmission. The last 10 received are stored for your later perusal. There's no mention of whether or not another message-paging-capable rig is required to send you messages. If not, that would let you be paged by anyone with a DTMF pad. Either way, though, this scheme, like all DTMF schemes, has very little usefulness in the U.S. because most repeaters won't pass DTMF tones; they deliberately block them to prevent jammers from decoding autopatch codes.

Where the alphanumeric system really shines, though, is in its application to the autodialer. Yep, each autodial memory can be named. This is seriously handy. Many times I've entered phone numbers into my rig, only to forget later whose they were. That won't happen with the FT-11R. After all, who can forget names like "Mom," "home" and "Jim"?

In addition to all the memories, there are two VFOs, A and B, and every memory can be tuned like a VFO. The memory management scheme is essentially the same as on all the Yaesu HTs since the FT-411, and it's perhaps the simplest, best-developed system in the industry. Unless you've never used any HT before, it won't take you very long to master the major features of this radio.

I was initially thrown that such a full-featured rig didn't include automatic repeater shift. Then I discovered that it is there, but you must turn it on. Unlike most HTs which offer it, this one's default settings leave it off. It's no big deal, though; you just turn it on once and forget it.

Who Needs Knobs?

What happened to the volume and squelch knobs? On this radio, both functions are controlled by two buttons on the front panel. Pressed alone, they turn the volume up and down. If you press the function button first, they adjust the squelch. On the display, a little vertical bar graph shows the current setting. It seemed odd at first, but I soon found I really liked this idea. There's no way the settings can get disturbed while the rig rides along in your pocket, purse or briefcase, and the bar graph makes it easy to see the setting. If you prefer, though, you can set the dial knob to duplicate the functions of the volume/squelch up and down buttons. But once you do that, you can't use it to tune the rig or select memories anymore; you must use the up/down tuning buttons (which are not the same as the volume/squelch up/down buttons).

On The Air

The receiver is very sensitive and particularly selective. There's no mistaking when you're 5 kHz off, because the audio gets so distorted you can't stand to listen to it. That suggests that the IF filtering is extra-sharp. Also, a glance at the schematic reveals a front end with several stages of voltage-tracked tuning, which should really help reduce intermod, at least as far as a tiny radio with no large front-end filters can. The receive audio is fairly good as long as you keep the volume down. Included in the box was a little slip of paper noting that the audio will distort if played at high volume levels. In truth, it distorts even at moderate levels. The intelligibility is still good, but I've heard other radios in this size class which sounded significantly better.

". . . for a 'drop in the pocket and go' handheld, this is the best one I've seen yet! It's a real winner . . ."

The transmit audio, though, is wonderful. In fact, it's even noticeably better than the already-good audio on my bigger HT. There's no obvious microphone hole, so I was worried at first, thanks to a previous experience with another rig which used a hidden mike. But this one works like a charm, however they're getting the sound to the mike element.

The Documentation

The radio comes with a full schematic, and the manual is very well written. I would point out, however, that the section on CTCSS makes it sound as though the optional FTS-26 tone module is required for any CTCSS operation. In fact, encode, which is the most useful part, is standard; only decode requires the module. A plasticized-paper "cheat sheet" booklet is provided, and it's quite detailed. In keeping with the size of the radio itself, the booklet is very small, so you will be sure to put it in your wallet or purse.

What I Liked

There's a lot to like in this little gem. It's really small, it works well and it's easy to use. The alphanumeric memory and autodial systems are very handy. The rig is quite solid, despite its comfortably light weight. The display is large and shows lots of information, including the final zero on the frequency. Even with the alpha mode engaged, the memory capacity is more than generous, and there are two sets of subband limits provided for versatile scanning.

The battery is charged by snapping it into a little stand, which then plugs into the wall charger. Cleverly, this stand lets you insert the battery with or without its being attached to the radio. So, unlike with many mini-rigs, you can use this radio with another battery while the first is charging. To me, that's essential.

What I Didn't Like

The few nit-picks I have on this radio are pretty minor. The receive audio could be improved. Also, the viewing angle of the LCD is unusually sharp, requiring you to look from above the radio. Especially at night with the lamps on, you can't see the display from below, and it looks washed out even when viewed straight on. Finally, the lamps don't stay on just because you keep pushing buttons; they go out after about five seconds anyway. You can, however, lock them on, which is great for base or mobile operation with an external power supply.

Conclusion

If you want a really small HT, check this thing out. If I were contemplating using one radio for base, mobile and HT operations, I'd probably select something bigger with direct DC input. But, for a "drop in the pocket and go" handheld, this is the best one I've seen yet! It's a real winner, and I'm not looking forward to sending it back.

The Challenge of 1750 Meters

No license required.

by David Curry WD4PLI/6

1750 meters is a hobby, just like amateur radio. In fact, it is much like old-time amateur radio; it separates the men from the boys! In the early days of radio, hams built their own equipment, and most operators did not even have licenses. 1750 meters is still true to that theme: "No license required, only skill desired."

Unfortunately, 1750 meters is a noisy, sometimes crowded, band filled with carriers and modulations. Well, guess what? Many of those carriers and modulations are European long-wave broadcast stations DX-ing over the Atlantic, and perhaps that code you hear in the background is actually a Lowfer sending his ID beacon. FCC rules limit transmitting antenna length to 50 feet and DC input to the PA to 1 watt. Even with these restrictions, surprising distances via ground-wave propagation occur regularly. Using a common noise blanker, audio filter, or even a phase-canceling device, an operator can clean up the band of light dimmers and power line noise that often can be discouraging. Simple receiving antennas such as an active whip or loop placed in a clear area and using a "virgin" ground (a separate, isolated ground that carries no power-line noise) can provide unimpeded reception.

Considering that communications technology has become so advanced, there is no reason why you can't enjoy the fun and challenge of 1750 meters just because the major ham manufacturers didn't include it in their rigs. Build your own radio, perhaps with a friend, and get on the air; it's that simple. You will find that you have more to talk about than the weather, and you'll share in the amazement of how a 1 watt signal can travel hundreds of miles under good conditions. Many hams can use their preexisting vertical ham antenna for 1750 meter operation using a loading coil at the base of the antenna. Most 160 meter antennas are ideal for work on 1750 meters.

1750 meters was originally set aside by the FCC as a frequency range for garage-door openers back in the early '60's, but as time passed, experimenters (many of them hams) found surprising success despite FCC limitations. These "experimenters" are referred to as "Lowfers," and are on virtually any day of the week. I can hear two or three of them on my TS-430S, loud and clear, from as far away as San Diego, 150+ miles away from my Burbank, California, QTH. In Hawaii, using a portable loop antenna, Sheldon Remington received Lowfer beacons Z2 and later H2, both located in California, over 3,000 miles away! SSB, AMTOR, RTTY, and packet have all been used successfully.

Design

Described here is a simple "introductory" CW two-way radio for 1750 meters. Antenna dimensions for 1750 meters can be found in *73 Magazine*, September 1991, in "Dual-Band Vertical" (for 160 and 1750 meters), page 38. Also of interest is "Noise Reduction Using Broadband Active Whip Antennas," *73 Magazine*, October 1992, page 38.

Please note Figures 1 and 2. The front-end preselector uses a tunable two-pole Chevychev bandpass filter to reduce unwanted signals, such as GWEN (Ground Wave Emergengy Network). The direct conversion receiver is an uncomplicated design using the NE602 chip. The NE602 Colpitts VFO provides the frequency reference for the transmitter section. The VFO can be PLL-controlled externally, facilitating CCW (Coher-

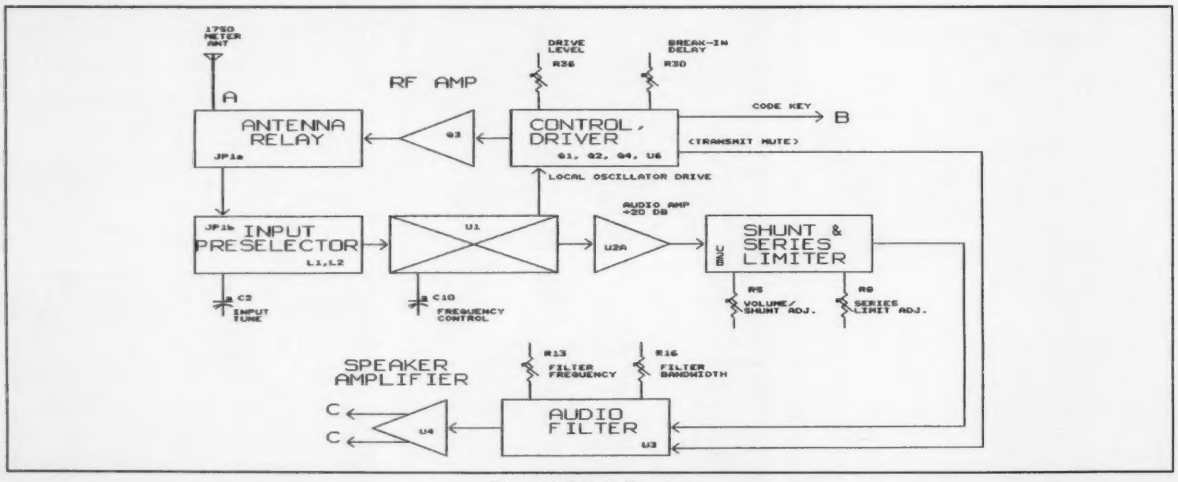

Figure 1. Block diagram.

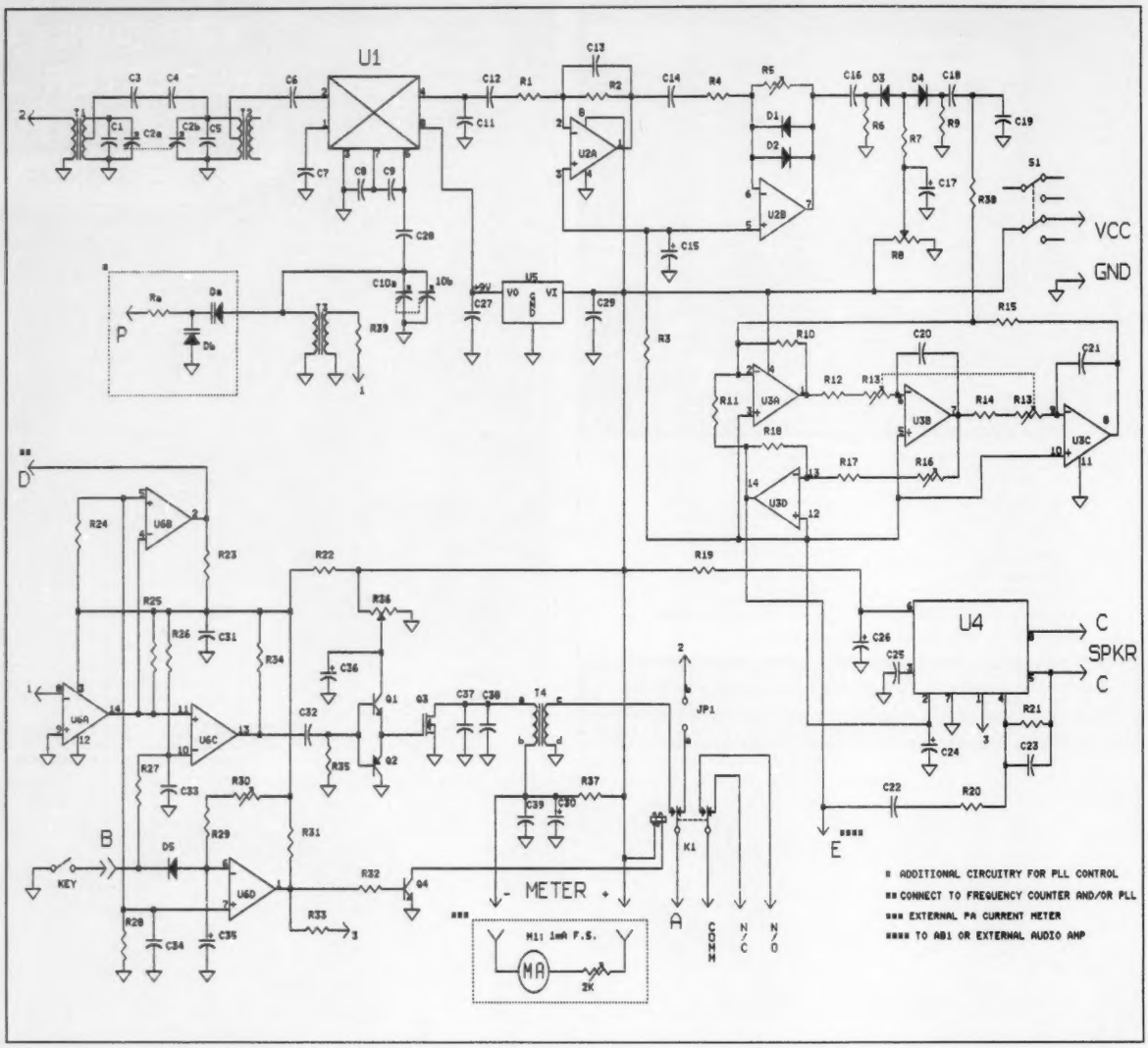

Figure 2. Schematic.

ent Continuous Wave) operation.

Noise is always a problem at these frequencies so two noise limiters are included to provide very effective limiting of high-amplitude man-made noise and static. A shunt limiter followed by a series limiter is used in this design, and this is superior to most designs found in commercial and military receivers. Audio filtering is included, with variable frequency and bandwidth control for precise filtering of the desired signal.

Ample audio output drives headphones and most speakers. This rig is capable of providing over 100 dB of gain with virtually no power supply hum. The transmitter section samples the VFO using a simple logic circuit, controlling the duty cycle and the keying of the amplified signal. The signal then drives a class E power output stage. This class of service is a very efficient 96%. Many thanks go to Mark Mallory for his excellent research into efficient class-E amplifiers and for sharing his information.

The transmitter section lends itself as an excellent beacon transmitter. Simply apply the beacon message to the code key input for reliable beacon transmission. As you probably know, purchasing components these days can be expensive; this was a major concern during the design of this project. All parts are "off the shelf," with the ordering part number given.

Beware: Simple "one-transistor" transceiver designs just do not work on 1750 meters. Don't be fooled!

Construction

Please note the component layout (Figure 3). You will notice that several component leads are soldered directly to the component side of the circuit board. This provides the ground connection for these components. When this occurs, be sure to solder the component lead to the ground plane *and* on the solder side. Note that capacitors are disc-shaped, while electrolytics are round and have the polarity marked. Transistors are designated by the half-moon shape, or round with a key. ICs are rectangular, with the "U" mark at the end.

I recommend soldering the ICs first. Notice that some pins must be soldered on the component side.

Next, solder transformers T1, T2, and T3. Dab some solder on the side of the transformer and ground plane to ensure a good ground.

Install all the capacitors, followed by the variables C1 and C10. C1 and C10 should be installed so that the side with five leads goes through the circuit board. Pull the leads firmly and bend at a 45-degree angle to hold while soldering. Note the small horizontal lead sticking out on the side of C1 and C10. Solder a wire from that lead through the hole in the circuit board under it.

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The MFJ-949E has a *full size* non-inductive dummy load measuring 3/4 inch diameter by 5 inches. It *easily* handles 300 watts of abusive tune-up power.

Watchout for cheap midget size dummy loads that changes resistance as it heats up -- marginal ones could burn up your rig.

***Custom* Inductor Switch**

The inductor switch is the most likely component to burn up in *any* antenna tuner.

The inductor switch in the MFJ-949E was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner -- it's not a flimsy *plastic* switch made for small signals and wired with *tiny* gauge wire.

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Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

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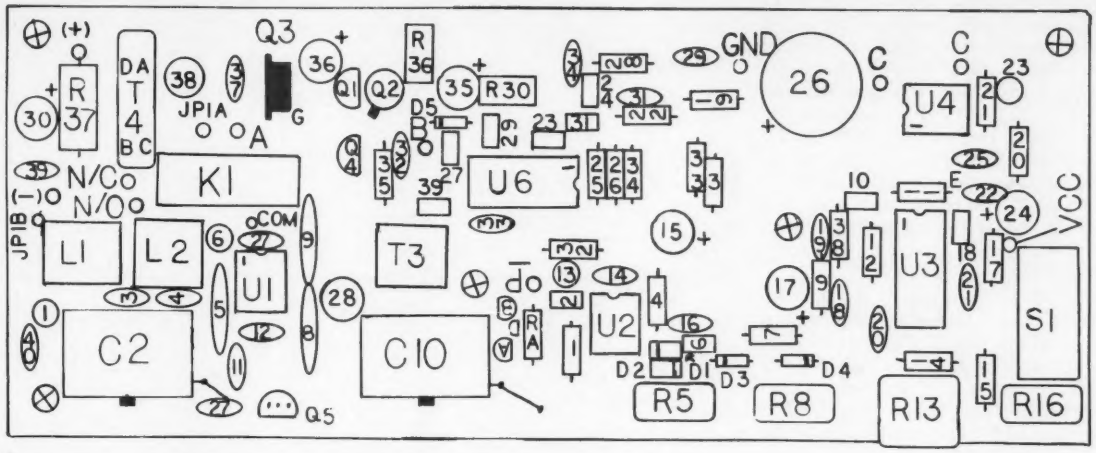

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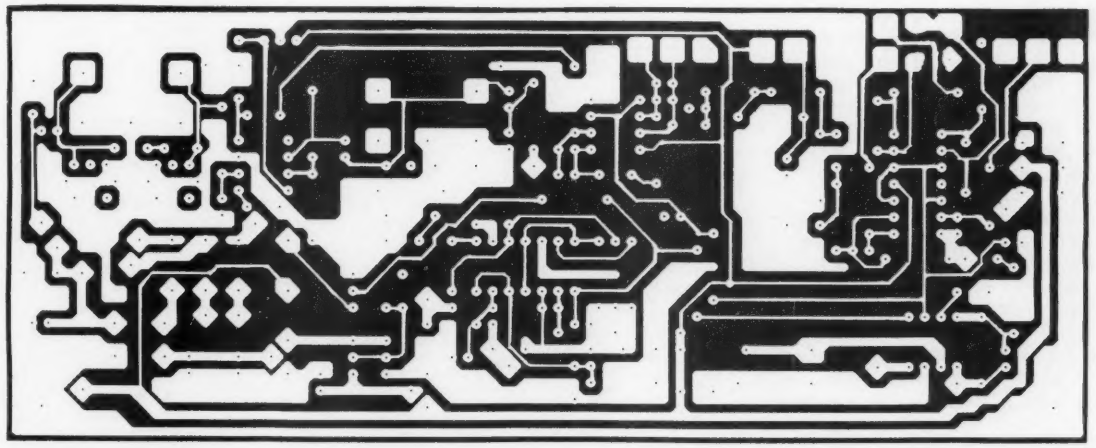

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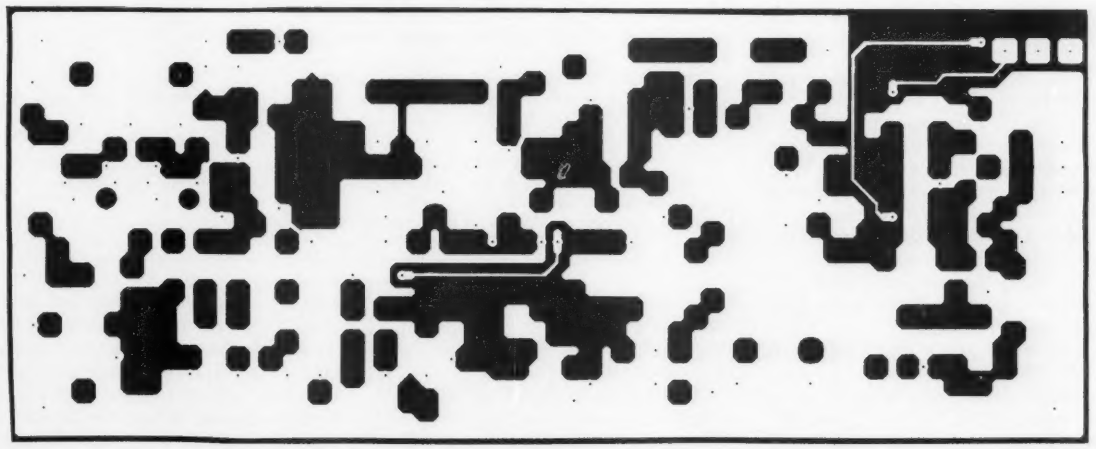

c)

Figure 3. Double-sided PC board: (a)parts placement diagram, (b) top foil pattern, and (c) bottom foil pattern.

Transformer T4 must be wound by hand. Wind the turns evenly and firmly. After you are finished winding, cut the wires so that about 1" remains from the toroid to the end of each wire. Remove the enamel insulation from the 1" ends with sandpaper. The sidebar has all the winding information you will need. Notice that the holes for T4 are marked "a & b" for the primary, and "c & d" for the secondary. They crisscross on the circuit board. Use an ohmmeter to make sure the wires don't get mixed up and the secondary wind doesn't accidentally go into the primary holes!

Now solder the remaining components. Resistors installed horizontally are indicated by a rectangle shape, while vertically-mounted resistors are a small square. Any vertical resistor with a lead going to the ground plane should use the longer lead as the ground lead. You may decide to "go all the way" and install your transceiver in a box or chassis. The LMB box listed in the optional component list is a good choice. It provides extra room for a speaker, meter, or antenna switch. The meter is both a luxury item *and* a necessity. To make a nicer finish for the front of the chassis, templates for the front and rear face plates are provided in Figure 4. Go to a photocopy store and copy them to a transparency. Be careful not to scratch the black from the transparency.

Apply a thin film of clear epoxy glue over the front of the box. Size up the transparency so the top of the box on the transparency is even with the top of the chassis. Be sure you can *read* the transparency before pressing the transparency to the adhesive. After the epoxy has cured for a few hours, cut away the excess transparency around the box with a sharp knife. Tap and drill each hole to a size a little larger than each control shaft to give some play. Repeat the same procedure for the rear chassis face plate. Use 4-1/2" aluminum spacers between the bottom of the circuit board and the floor of the chassis, and four 4/40 nuts and bolts to secure the board.

Calibration

Connect the antenna, power supply, etc. to these points:

- •A—50 ohm transmit antenna port.
- •B—Code key port. Transmit is initiated when point B is grounded.
- •C—Both points marked "C" are connected to 8-32 ohm speakers or headphones.
- •COMM—Common terminal for auxiliary relay.
- •D—Frequency monitor port. CMOS level square wave output connects to frequency counter and/or PLL input.
- •GND—Connect power supply negative or ground to this point.
- •JP1—Receive input select. Short JP1a&b to use antenna at port "A" for receive. RECEIVE ONLY antennas connect to JP1b.
- •N/C—Normally closed terminal for auxiliary relay control.
- •N/O—Normally open terminal for auxiliary relay control.

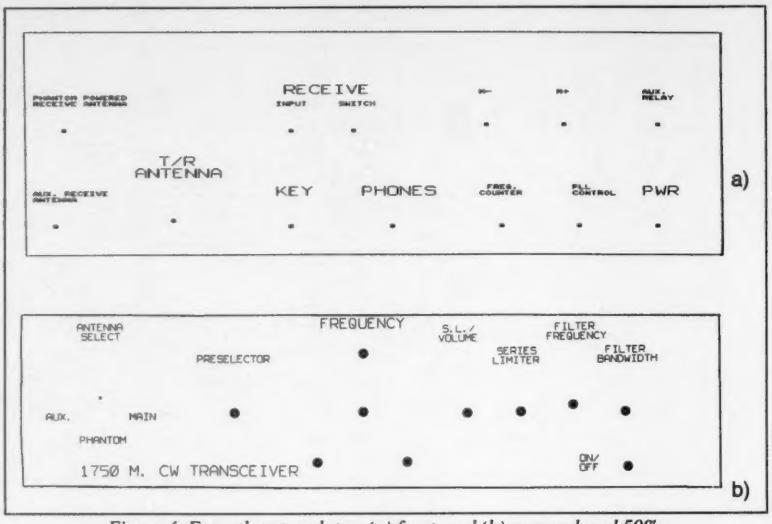

Figure 4. Face plate templates: (a) front, and (b) rear, reduced 50%.

T4 Winding Data

Power	C37	C38	VCC	T4a/b	T4c/d	Form
1 watt*	X	N/A	12 VDC	93 Turns #30 Ga.	49 Turns #24 Ga.	T-68-3
3.5 watt**	N/A	X	12 VDC	49 Turns #24 Ga.	48 Turns #24 Ga.	T-68-3
10 watts	X	X	18 VDC	33 Turns #20 Ga.	37 Turns #20 Ga.	T-130-3

N/A: Not used.
* Heat sink recommended.
** Heat sink required.

Formulas for Calculating Efficient PA Design

L: Tank inductance — C: Tank capacitance
Z: PA load resistance — V: VCC supply voltage
F: Operating frequency — P: Output/input power

$$L = \frac{.2085 \times V^2}{P \times F} \qquad C = \frac{1}{(2 \times pi \times 1.2915 \times F^2) \times L} \qquad Z = \frac{1.2638 \times V^2}{P}$$

T4 Inductance & Turn Ratio Formulas

T-68-3: Number of turns = $100 \times \sqrt{(\text{Inductance in uH}/195)}$

T-130-3: Number of turns = $100 \times \sqrt{(\text{Inductance in uH}/350)}$

To match the impedance at the drain of Q3 to a 50 ohm impedance, you will need to know the turns ration (Tr):

$$Tr: \sqrt{(Zd/Z1)}$$

Zd: Drain resistance — Z1: Load resistance (usually 50 ohms)

These formulas are included to help solve any particular matching requirement. The above table can be used to match most requirements.

The frequency value for "F" can work for frequencies +/- 10 kHz.

- •P—PLL or phase control of VFO. Section normally not used.
- •VCC—12-18 volts, filtered DC or battery to the terminal.

Connect 12 volts of power to VCC points. A frequency counter or receiver covering 150 kHz to 250 kHz will be required.

Connect the frequency counter to point "D." Turn the transceiver ON. Turn the tuning capacitor C10 maximum clockwise. Turn the slug in T3 until the frequency reads 189 kHz. If no frequency counter is available, use a long-wave receiver, general coverage receiver, or ham radio that can accurately tune to 190 kHz. Place a small piece of wire from the receiver antenna input near U1. Tune the receiver for a center frequency of 189 kHz. Listen for a tone while turning the slug of T3. Slowly turn the slug until you hear a zero beat on the receiver. Next, align the preselector. T1 and T2 must be tuned to the same frequency. If you have a signal

generator, place a low-level (approximately 100 µV) signal of 175 kHz to the input at JP1b. On the transceiver, turn the Preselector and the Filter Frequency controls to the 12-o'clock position. Rotate the series limiter and the filter bandwidth controls to full counterclockwise.

Tune the Frequency control for 176 kHz.

Turn the slugs on T1 and T2 for maximum volume, decreasing the signal generator output as the tone becomes louder. If no signal generator is available, connect the antenna to JP1b and listen for any carriers by adjusting the Frequency dial and volume controls. Turn the Preselector capacitor to the same setting as the Frequency capacitor. Turn the slugs in T1 and T2 for maximum signal strength.

Operation

The Volume control will limit the amplitude of all signals past a certain point. This can be used to increase the gain of a desired signal that is buried in man-made noise, cutting off the peaks of the noise while leaving the signal unaffected. The series limiter can be used to lower the volume when the volume/shunt limiter control is used for extreme limiting. You will find that the volume/shunt limiter is better at reducing high-level man-made noise, while the series limiter is better for reducing static and occasional high-impulse noise. The audio filter frequency and bandwidth are adjusted for the desired amount of filtering.

An important feature is the input Preselector control. The preselector filter is very sharp, allowing only a small slice of the band to be received. If, for example, the beacon you want to hear is on 180 kHz, tune the Frequency control for a frequency of either 179 kHz or 181 kHz. The beacon message will be heard at a 1 kHz tone: 180 kHz-179 kHz = 1 kHz, or 181 kHz-180 kHz = 1 kHz. The preselector must be tuned to the desired signal at 180 kHz for maximum pickup. Choosing whether the upper or lower VFO frequency is best depends on which provides the clearest reception. An example of two-way operation could be you transmitting on 182 kHz with the preselector peaked to your friend's frequency of 182.4 kHz. Your friend's preselector would be peaked to your frequency of 182 kHz. As you can see, tuning the preselector above and below your center frequency provides a lot of flexibility.

Transmitting a beacon is very useful while you're not on the air. It is especially helpful to other stations that want to know if they can hear you or not, and helps with antenna testing and band conditions. The transmitter is easy to use. Simply connect your beacon ID or code key or PK-232 CW to the key input. Adjust your time-delay potentiometer (R30) for the desired time delay. The PA drive control (R36) can be set for maximum VCC. The transmitter was designed for link or tap coupling, using 50 ohm coax from the transceiver to the antenna loading coil. Direct connection from the cold end of the loading coil to the secondary of T4 is fine.

A 1 mA meter may be used to monitor the PA current. However, meters can be expensive; you can use a VOM or VTVM instead. Connect this to the meter "–" and "+" points on the circuit board. The voltage indicated is the input current to the PA. 1 watt of input power is 83 mA at 12 volts, or 83 millivolts on the VOM or VTVM. Also remember to measure the PA voltage at the "-" meter point since there is a slight voltage drop across R37 when calculating input power.

Parts List

Part #	Description	Purchase
C1,C5	470 pF poly cap	Mouser: 23PS147
C11	0.047 µF film cap	Digi-Key: P4521
C13,C23	0.001 µF polystyrene cap	Mouser: 23PW210
C15,C17,C24, C30,C35,C36	10 µF/50 VDC elec. cap	Mouser: 140-XRL25V10
C18,C25,C31,C39,C27	1 µF monolithic cap	Newark: 90F1907
C19,C33	0.01 µF disc cap	Mouser: 140-CD50Z6-103M
C2,C10	400 pF tuning cap	Mouser: 24TR218
C20,C21	0.018 µF poly cap	Digi-Key: P3183
C26	2200 µF/16 VDC electro cap	Mouser: 140-XRL16V2200
C28,C38	0.01 µF polystyrene cap	Mouser: 23PW310
C3,C4	7.5 pF NPO disc cap	Mouser: 21CB008
C40	0.022 µF poly cap	Digi-Key: P3223
C6	0.0047 µF poly cap	Mouser: 23PW247
C7,C12,C14,C16,C22, C29,C32,C34	0.1 µF ceramic disc cap	Mouser: 140-CD12U6-104M
C8,C9,C37	0.0027 µF polystyrene cap	Mouser: 23PS227
D1,D2,D3,D4,D5	Diode	Mouser: 592-1N914A
K1	DPDT relay	Digi-Key: Z768-ND
Q1,Q4	2N2222A NPN transistor	Mouser: 511-2N2222A
Q2	2N2907A PNP transistor	Mouser: 511-2N2907A
Q3	Power MOSFET	Mouser: 511-IRF510
R1,R4,R20	3.3k ohm 1/4W	IME
R10,R11,R15	100k ohm 1/4W Metal 1%	Mouser: 29MF250-100k
R12,R14	4.02k ohm 1/4W 1% metal	Mouser: 29MF250-4.02k
R13	10k dual audio taper pot	Calrad: 25-396
R19,R22	12 ohm 1/4W	IME
R2	33k ohm 1/4W	IME
R23,R32,R33,R34	1k ohm 1/4W	IME
R25	560 ohm 1/4W	IME
R3,R7,R21,R29, R35,R38	82k ohm 1/4W	IME
R30	250k ohm PC trimpot	Mouser: 32RM503
R31,R39	2.2k ohm 1/4W	IME
R36	2k ohm PC trimpot	Mouser: 32RM302
R37	1 ohm 1W	Mouser: 29SJ901
R5,R16	500k ohm PC pot	Mouser: 31CW505
R6,R27,R28	6.8k ohm 1/4W	IME
R8	10k ohm PC linear pot	Mouser: 31CW401
R9,R17,R18,R24,R26	10k ohm 1/4W	IME
S1	DPDT PC switch & knob	Digi-Key: EG1003-ND
T1,T2,T3	0.63mH transformer	Digi-Key: TK1201
T4	Toroid transformer	Amidon: T-68-3
U1	NE602 mixer/amp	Digi-Key: NE602AN
U2	Low-noise op amp	Mouser: 511-LF353N
U3	Quad op amp	Mouser: 511-LF347N
U4	Audio PWR amp	Newark: MC34119P
U5	+9 VDC regulator	Mouser: 333-78L009AP
U6	Quad comparator	Mouser: 511-LM339AN

Sources:
Mouser Electronics—(800) 346-6873
Digi-Key Sales—(800) 344-4539
Calrad—(213) 465-3504
Newark Electronics—(818) 888-3718
Amidon Associates—(310) 763-5770
IME—(817) 473-1730

A drilled and etched PC board is available for $22 plus $3 S & H; and this project is available in a complete kit for $89 plus $3 S & H from: Curry Communications, 737 N. Fairview St., Burbank CA 91505; (818) 846-0617. Brochures are available; send SASE.

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

★ JST-145 COMING SOON ★

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with Power Factor Correction (PFC) and "silent" cooling system designed for continuous transmission at maximum output.

"This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained."

JRC *Japan Radio Co., Ltd.*

430 Park Ave., 2nd Floor New York, NY 10022 Phone: (212) 355-1180 Fax: (212) 319-5227

CIRCLE 159 ON READER SERVICE CARD

Number 11 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister WA5ZIB
14714 Knights Way Drive
Houston TX 77083-5640

Interest in the amateur-radio satellite program has increased rapidly in recent years. Today we have analog satellite transponders for CW, SSB and FM, and digital satellites running 1200 and 9600 bps (bits per second) AX.25 packet. Equipment manufacturers are designing and selling more radios conceived specifically for satellite operation. Current articles and books have surfaced to help enthusiasts get on the air. News of the amateur satellite programs has been brought directly to current and future satellite chasers through club talks, conventions and operating events.

AMSAT (The Radio Amateur Satellite Corporation) was prominent at the Dayton Hamvention in April and the ARRL (American Radio Relay League) 1994 National Convention in June at the Arlington Convention Center in North Texas. Field Day provided many hams an opportunity to try satellites from remote locations. Participation was very high this year. Most satellite transponders were packed for the event. Bringing it all together is the AMSAT 25th Anniversary Annual Meeting and Space Symposium this October. The gathering promises to have a record attendance as work progresses with the Phase 3D project, the largest and most versatile amateur-radio satellite ever.

AMSAT Presentations

Whether the event is a local club meeting or the ARRL National Convention, AMSAT has a message to send to the amateur-radio community: Work on Phase 3D is progressing rapidly. This satellite represents the largest, most complex and versatile hamsat to date. A matrix of computer-controlled receivers and transmitters covering ham bands from HF through the microwaves will be attached to solid-state amplifiers and high-gain spacecraft antennas. The result is to be a satellite at least 10 times more powerful than the popular AMSAT-OSCAR-13, and with many more bands in use from space. The program is international, proceeding well, but is still in need of further funding.

Several AMSAT volunteers came to the ARRL convention in early June to present the case for Phase 3D. AMSAT President Bill Tynan W3XO could be found at the AMSAT booth or in the AMSAT forums on Saturday and Sunday. He talked to the standing-room-only crowd about AMSAT's participation in the Phase 3D project and the future of the organization.

Keith Baker KB1SF, AMSAT VP of Strategic Planning, described project details and how all the pieces fit together. Phase 3D does not represent the first time an internationally-supported hamsat has been built, but does embody the largest joint project with several new groups participating. Keith is also known for his work on *How to Use the Amateur Radio Satellites*. Now in its fourth edition, this AMSAT publication provides vital data and operating information on all current amateur satellites. It also contains information on Phase 3D, other future satellites, and a glossary of terms associated with hamsats. The booklet is available from AMSAT at (301) 589-6062, or you can write to 850 Sligo Avenue, Suiie 600, Silver Spring MD 20910.

Keith Pugh W5IU, AMSAT VP of Operations, spent a good deal of time demonstrating AMSAT satellite tracking software and answering questions. Keith has been a volunteer AMSAT supporter for many years and has promoted the satellite program at many ham radio conventions in the Southwest. Several AMSAT area coordinators attended the convention and helped with the AMSAT booth and talks.

Photo A. AMSAT VP for Strategic Planning, Keith Baker KB1SF, discussed key facets of the Phase 3D satellite program at the ARRL National Convention in Arlington, Texas.

The North Texas Section of the West Gulf Division of the ARRL worked in conjunction with the Dallas County REACT organization to put W1AW/5 on the air from the convention center. The REACT group had their mobile communications center at the site, complete with satellite rigs and antennas provided by Don Gwynne K5EVI. This was the second time W1AW has been to the Arlington HamCom. The first was in 1989 for the League's 75th Anniversary Celebration in 1989.

Field Day 1994

For many years the ARRL has offered a 100-point bonus to participating Field Day stations for making one satellite contact during the event. This year was no different but due to the large number of active hamsats some groups discovered that the satellites can offer a significant number of contacts and thus enhance their overall score. The satel-

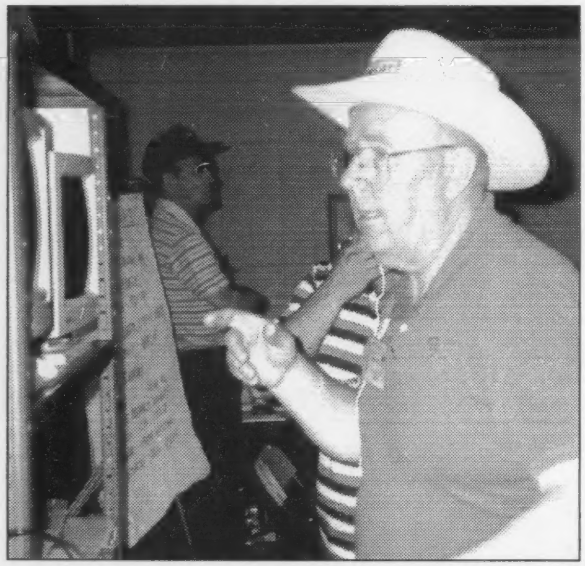

Photo B. AMSAT VP of Operations, Keith Pugh W5IU, demonstrates tracking software in the AMSAT booth at the convention.

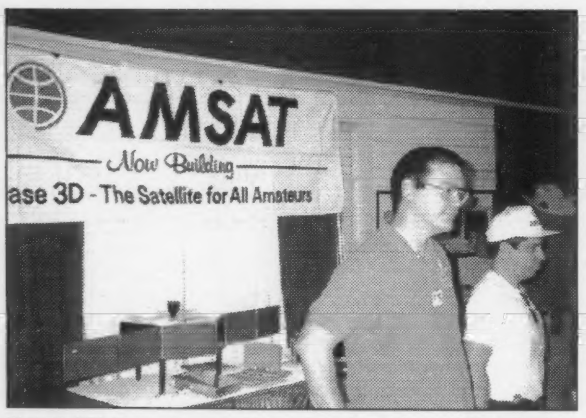

Photo C. With the small model of Phase 3D in the background, Keith Berglund WB5ZDP and Randy McKinney N5SVW answer questions at the AMSAT booth.

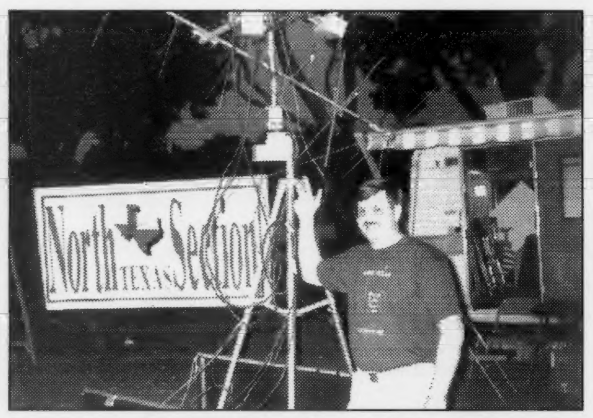

Photo D. Checking out the satellite antennas at the ARRL convention with Bob N5LCO.

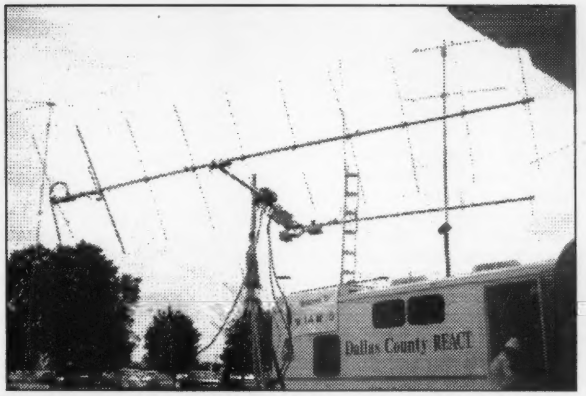

Photo E. W1AW/5 was on the hamsats from the convention site thanks to K5EVI and the Dallas County REACT team.

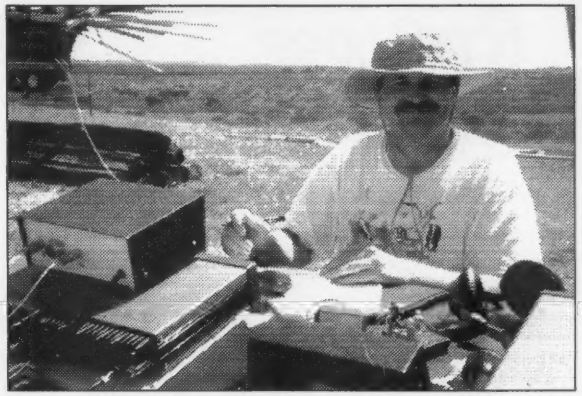

Photo F. Bob N5LCO working A-O-13 from the central Texas Field Day QTH of K5ERP (Effective Radiated Power).

lite station is "free." It does not add to the transmitter class total.

AMSAT supporters have found Field Day to be an opportunity to promote this expanding facet of the hobby. Setting up a satellite station in the field is not as simple as putting an HF station on the air, but it's getting easier all the time. To make a few contacts via the Russian RS-10 satellite, only a 2 meter transmitter capable of CW (some FM rigs do fine) and an omnidirectional antenna are needed for the uplink, while any SSB 10 meter rig can listen for the downlink.

The single-channel FM satellites, AMSAT-OSCAR's 21 and 27, were available, but due to the large number of stations trying to make contact, it was impossible to make very many per pass on these low-orbit satellites. High-power and directional antennas were a necessity. The congestion was almost comical at times and points out the advantage of the linear transponders that allow many stations to utilize the satellite simultaneously within a passband of frequencies.

A-O-13, in its high-elliptical orbit, was heard and worked by many during Field Day. For others, though, the veteran satellite A-O-10, was preferred. A-O-10, while uncontrollable due to the failure of the on-board computer many years ago, was in a good position and in great condition for early Sunday morning. Signals were excellent from both, and contacts were easy for the well-equipped.

AMSAT sponsored its own form of Field Day. The rules were a bit different from those of the ARRL. Each satellite represented a separate band, and special rules applied for messages sent via the digital birds. The winner of the 1994 AMSAT Field Day competition will receive a special plaque at the AMSAT General Meeting in October. This contest will continue in 1995 with amended rules to enhance efforts via the digital satellites and provide added incentives for operation via different modes on the same satellite. Some groups may find multiple satellite stations necessary to cover all the options next year.

The AMSAT Meeting

Mark your calendars for the AMSAT 25th Anniversary Annual Meeting and Space Symposium. The event starts Friday October 7 and continues through Sunday October 9. The site this year is the Holiday Inn at the Orlando, Florida, International Airport. It is adjacent to the Phase 3D Spacecraft Integration Facility.

This is your chance to hear all about the Phase 3D project and actually see the progress on the flight hardware. Many papers will be presented at the symposium on Friday and Saturday. Topics to be covered include all phases of amateur satellite operations.

Very reasonable rates have been obtained at the Holiday Inn; for singles or doubles the cost is $58. Call (407) 851-6400 to make reservations. Be sure to mention the AMSAT rates. To register for the symposium or to get further information, call AMSAT at (301) 589-6062.

The Orlando area has much to offer, including NASA's Cape Canaveral Visitor's Center and the Disney World complex. If you have been active on the satellites, this event is an opportunity to meet with many of the folks you have contacted. It is also a great occasion to ask questions of the AMSAT Board of Directors and find out where we are headed. See you in Orlando! 73

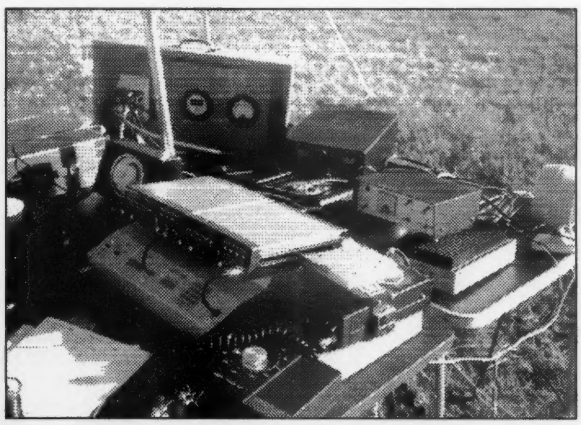

Photo G. The satellite rig collection at the K5ERP Field Day site.

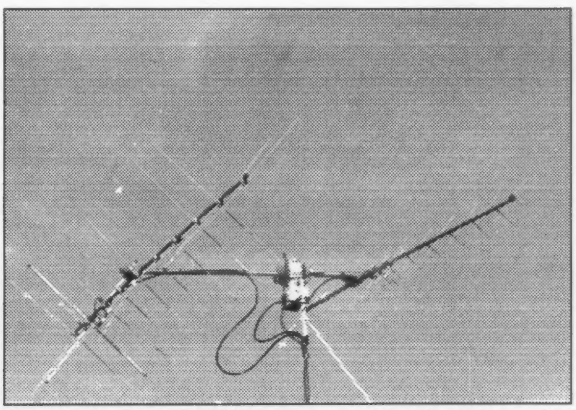

Photo H. Older Cushcraft OSCAR antennas and some antique rotors provided reasonable results for the K5ERP portable operation.

Number 12 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Several months ago, I mentioned one of the programs on the fifth disk in the "RTTY Loop" collection, PacketPeT Lite. This is a shareware version of PacketPeT, a versatile multitasking program for the radio amateur running RTTY on the PC.

A look at the features of PacketPeT will give you an idea of just what it can do. This Windows-based program was compiled with the Borland style controls, giving consistency to windows and control functions. Several copies of PacketPeT can be running at the same time, supporting several TNCs, if you have the ports available. It can even run in the background, notifying you of incoming traffic.

This program will run with most hardware TNCs, including, among others, the "standard" TAPR TNC2, the AEA PK-88 and PK-232, and the Kantronics KAM. It requires a PC compatible with a 286 or better processor, at least 2 Mb of RAM, at least 2 Mb of space on the hard drive, a VGA display, Microsoft Windows 3.x or OS/2 version 2.x, and a hardware TNC, such as the TAPR TNCs, AEA PK-232, or Kantronics KAM. While not required, a mouse or trackball makes using the program much easier.

The program installs with the rather standard Windows Setup type routine, and creates its own Program Manager group, with icons for each "flavor" of TNC. A supplied password is required, along with your call, for the program to run. Once entered, this is retained within the program, making this form of copy protection livable, to say the least.

The main screen displays a top row of menu choices, including the standard FILE and EDIT, along with more specific PACKET, MODES, and CHANNELS. An integral text editor is available for editing received or transmitted text. The large window at the top is the receive window, with a smaller transmit window at the bottom. A CONNECTS window shows the current number of stations connected to, polling the TNC after each ***connected and ***disconnected message to determine the correct status of each channel.

As you can see, this is a powerful program that fills the needs of many who have been looking for the best program to run that multimode controller. It should be mentioned, though, that this is a *packet* program. Although your controller may operate on other modes, PacketPeT is strictly packet radio terminal software. You will have to use another program to run your controller on straight RTTY, CW, or other supported mode.

This said, I think anyone who is running a compatible computer with the hardware and software requirements outlined above would be happy with this package. If you want to "try before you buy," check out the end of this column for details on how to order disk #5 of the RTTY Collection, which has PacketPeT Lite, the shareware version of PacketPet, on it. Otherwise, drop a note to Chuck Harrington Software, Inc., 1565 Brazilian Lane, Winter Park, Florida 32792-2309, and tell him you want a copy of PacketPeT, as described in this month's "RTTY Loop." I'm sure he will be happy to send you current pricing and availability information.

I received a letter from Bill Shimmin W7GBC of Tacoma, Washington, which speaks well of you RTTY Loopers. Bill recalls that "sometime back, I wrote to you regarding a problem I was having in getting started in RTTY using a CP-1 and a C-64 computer. Your mention in the March 1994 issue of *73* brought a number of responses from your readers. Of special help were: Gail KC8V; Frank WA6RBQ; Bart W6OWP; Paul WA4FHY; and John KC7BS. Your readers really came through!

"I think my main problem was not recognizing that different manufacturer's software require different pin connections to the C-64. Your readers were most helpful in this regard. Also, your April article confirmed much of this information as it applies to the CP-1.

"One other comment: I originally had the impression that the CP-1 was more or less out-of-date in today's RTTY environment. Not so—as a number of your readers have pointed out."

Well, Bill, it's great hearing from you, and even more wonderful the way the readers of this column chipped in and lent a hand. To you: it's our pleasure; to our readers: my sincere thanks.

As I mentioned above, the "RTTY Loop" software collection continues to grow, with six disks available by the time this is published. Each collection is over 1.2 Mb of stuff: ham information, terminal programs, schematics, and the like. A list of the directories of each disk is available on the Radio SIG on Delphi, or may be yours for a self-addressed, stamped envelope mailed to me at the above address. Email users on CompuServe, America Online, or Internet can get the list as well by sending me a message on one of these services. The collections themselves can be yours for not too much trouble. Just send me sufficient media for each collection a (3.5" HD 1.44 Mb disk is fine, $2 in US funds for each disk to be filled, and a self-addressed, stamped return disk mailer) and I'll turn it around to you post haste.

Now, those Email addresses are: CompuServe—75036,2501; DelphiMarcWA3AJR; America Online—MarcWA3AJR; Internet—MarcWA3AJR@aol.com.

Next month, I have a batch of letters to answer. That means that the IN box will be empty. Why not send in a comment or question of your own, for a future slot in "RTTY Loop"? 73

CARR'S CORNER

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Falls Church VA 22041

Out of this World DX

Several issues ago I covered the 10 May 1994 solar eclipse, and recommended some radio observation techniques for "looking" at the eclipse via ham radio. An eclipse of the sun occurs when the moon passes between the earth and the sun, temporarily blotting out the sun, or at least a part of it. The degree of blotting out of the sun is a function of where one observes relative to the "ground track" of the eclipse shadow. This year's eclipse was an "annular" eclipse, meaning that the moon didn't fully blot out the solar disk, even in totality, but rather left a ring of light (hence the "annular" name).

People observing solar eclipses tend to use lower frequencies because the main effects are seen at those frequencies that are most affected by D-layer ionization. Anyone who listens to 75/80 meters knows that D-layer absorption during daylight hours is quite high, but at night, as the ionization levels of the D-layer decline, the absorption gradually disappears and skip communications (via the ionosphere) takes place. Indeed, DXCC has been awarded for all 75/80 meter band contacts. And, if you're a denizen of the pre-dawn like me, a distressing habit I picked up delivering a morning newspaper 35 years ago, you'll know that all kinds of wonderful long-distance stuff is heard in the hours 'tween midnight and sunrise.

When a solar eclipse occurs, ionization levels in the D-layer begin to melt away, just like at night, and the lower frequencies become slightly more active. In an annular eclipse the return to night conditions seems a tad less than in a total eclipse, probably due to the light that peeks around the moon during such an event.

Several people wrote to me and shared results of their 10 May observations, but Gordon Hayward VE3EOS sent along a computer graph of his data (see Figure 1). Gordon selected 5 MHz WWV in Fort Collins, CO, for his observations. His receiver was a tube-type World War II era ATR5, which he left on for several hours of stabilizing warm-up. Gordon calibrated the S-meter of the receiver for S-9 being equal to a 50 μV signal level. Data was collected using a computer data logger that recorded the S-meter readings every 10 seconds for several hours (7,711 readings).

The graph in Figure 1 shows the results of Gordon Hayward's observations. For comparison Gordon left the instrument recording from sunset the evening before until after the eclipse, showing clearly the expected behavior for the 5 MHz signal in the presence of changing D-layer ionization levels. The signal strength of WWV (5 MHz) rises from -38 dB (relative to S-9 or 50 μV), to something higher than S-9 (which is the 0 dB level). The signal levels remain high throughout the day, and then drift back to daytime levels within a couple of hours post-sunrise.

The eclipse was recorded at 1700 UTC, with a 4-5 dB rise. Again, it probably would have been more if the eclipse had been total, or if it had lasted longer; to quote Gordon: "The ions aloft likely take some time to recombine when the light levels drop." Gordon's recording site was Kitchener, Ontario. The peak indication occurred at a time when the eclipse ground track was about midway between Kitchener and Fort Collins (site of WWV).

Good work, Gordon, and thanks for sharing the results with the rest of us.

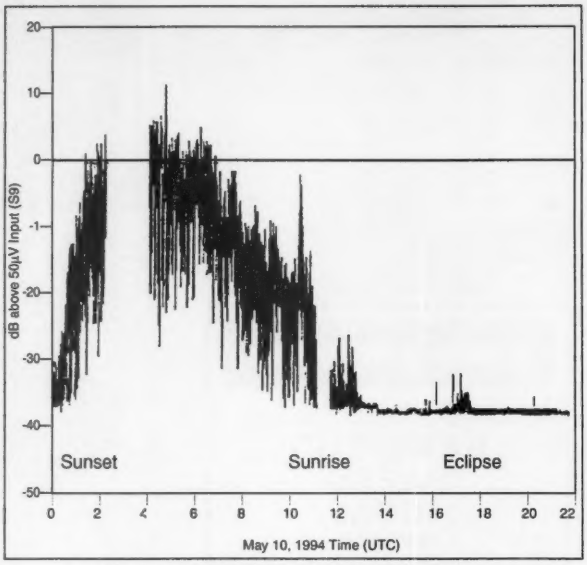


Figure 1. The May 1994 solar eclipse WWV sounding.

DXing Jupiter (One-Way)

The planet Jupiter, the largest in our solar system, is well-known as a radio source. Unlike other astronomical radio sources, which are microwave, the Jovian radio signals are found between 5 and 40 MHz, with a distinct peak in activity between 18 and 24 MHz . . . frequencies that encompass three amateur radio bands.

The sounds made by Jupiter are a rising and falling "swooshing" sound . . . my wife likened them to waves . . . in the white noise. I suspect that most 13, 15 and 17 meter band operators have heard these signals and didn't know what they were, or simply ignored them altogether. According to the literature, a person looking for Jovian radio signals has about a one in six chance of hearing them.

"An eclipse of the sun occurs when the moon passes between the earth and the sun, temporarily blotting out the sun, or at least a part of it."

In the third week of July, a comet that has broken up is scheduled to impact Jupiter (which should be past when you read this column), and the impact will profoundly affect the Jovian atmosphere for weeks to come. Quite a spectacular display of radio activity is expected, and some sources expect it to continue for weeks. Perhaps what this means is that the chances of hearing Jovian noise rise from one in six to something a little more probable.

So what do you need to listen in on the Big Fella of the solar system? Not much, it turns out. It would be handy to have a general coverage receiver that does a competent job over the 18 to 24 MHz range. Even a ham-band-only receiver should result in observations much of the time. It would also be handy if the bandwidth of the receiver was relatively wide—say—what one might see on a receiver with "Wide AM" capability. Prime listening hours are 2200 to sunrise, local time. The idea is to get as many interfering signals off the air as possible, and that includes skip signals. Indeed, on the non-amateur portions of the spectrum, where there is little possibility of local stations, the 2200 starting time could be earlier on any day where the maximum usable frequency (MUF) drops significantly below 18 MHz earlier than 2200 hours.

The signals from Jupiter should be audible any time the planet is above the horizon, and "transmitting." Astronomical books and publications can usually give you that data. If you don't know how to access it, then get in touch with a local astronomy club or stargazing buff.

Jupiter can rise pretty high in the sky, and that can affect your choice of antenna. A 15 meter beam aimed in a southerly direction (for North American readers) will probably do the trick, provided that its elevation main lobe isn't too horizon-restricted. In any event, a simple 15 meter dipole will also do the trick. Some observers use three dipoles on the same feedline, cut for 13, 15 and 17 meter ham bands, with overlapping coverage for the frequencies between them. The dipole should be run east to west, so that it looks north-south.

A lot of Jovian signal hunters use a variant of the directional discontinuous ring radiator (DDRR) antenna. That's the one in *The ARRL Antenna Book* that looks a bit like a horizontal hula hoop, with a section cut out along the rim, laid over (and about a foot above) a chicken wire ground plane or "counterpoise" ground. Although the signals should be strong (Jovian signals are second only to solar signals in strength) when the DDRR antenna is ground-mounted, some Jovian hunters like to angle it up on a stand so that it faces the southern sky in the vicinity of where Jupiter rises.

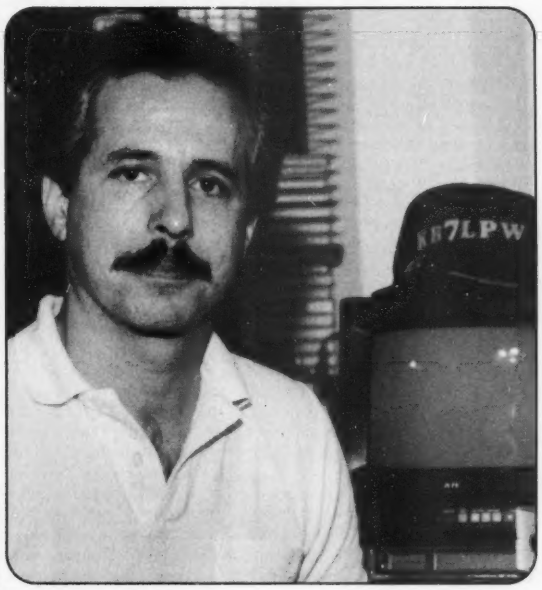
Let me know if you capture any Jupiter signals. I'd be interested in your observations.

Antlers for Windows

A number of readers have obtained the Antlers antenna calculator software from me over the past two years. The Windows version is now available ($30). This new version makes the same calculations, but uses scroll bars to enter critical parameters (such as operating frequency). It also expands the loop antennas' function. A schematic of each antenna is viewed on the screen whenever a selection is made. If you are interested, contact me at P.O. Box 1099, Falls Church, VA 22041. 73

HAM RADIO & MORE

National Talk Radio Show With Len Winkler, KB7LPW



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QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

My grandfather always told me fall is in the air when the wind blows across the wheat stubble. Since the wheat has been cut and the wind is whipping up, let the autumn homebrewing season begin! I can't think of a better way to celebrate the end of summer than smoking a resistor or two on the perfboard. Since the summertime QRN is finally starting to wind down, an 80 meter receiver would be a grand project to start the season.

The LCK-80

This project is a simple little superhet receiver based on the ever-popular NE602 mixer. The LCK-80 comes from the gang in the UK and is kitted up and sold by Kanga. Bill Kelsey (3521 Spring Lake Drive, Findlay OH 45840; telephone: 1-419-423-5643) is the US distributor for Kanga kits. The price of the LCK-80 (both the receiver and transmitter boards and parts) is $70 plus shipping.

Thanks in part to the newer generation of integrated chips, such as the NE602 mixer and the MC1350 IF amplifier, building a superhet receiver is not much more difficult than a direct conversion receiver. Perhaps the biggest stumbling block is the IF filter and the BFO crystal. The LCK-80 comes with a set of matched crystals for the IF filter and the crystal for the BFO. You can change the operating frequency of the LCK-80 by using a different IF frequency, but you'll need to order a different set of rocks if you do. The required information is included in the LCK-80 instructions.

Signal Flow of the LCK-80

There are two tuned filters signals must pass through before going to the NE602 mixer. The front end will tune only one section of the 80 meter band. After the desired signal passes through the tuned sections, the signal is mixed in the NE602. The local oscillator is also produced by the NE602 chip. The operating frequency of the local oscillator is 8 MHz. The local oscillator is tuned by a 40 pF variable capacitor. Operating frequency is set by the transformer and capacitors making up the tuned circuits. I found the operating frequency was too low, and ran out of adjustment on T3. So, I reduced the value of the capacitance in the circuit, allowing T3 to cover the proper frequency range. With the local oscillator running at 8 MHz, it's a bit touchy setting T3 for the proper frequency.

After the mixer the signal travels though four matched crystals. The crystals provide the selectivity of the receiver, which I find to be just about the way I like to hear my CW—not real tight.

After the crystal filter, the signal is amplified by a dual-gate FET. This is a different route than that normally taken. Most designs use the MC1350 IF amplifier. But, I've found this chip to be a bit touchy. It can *take off* on you just by looking at it sideways. The FET provides enough IF gain, while remaining stable.

A second NE602 mixer is used as a product detector. The BFO crystal can be netted by a board-mounted trimmer capacitor. You can't select between sidebands, unless you add a second crystal and a switch.

Audio from the product detector is routed to the usual LM386 audio power amplifier. This chip provides enough bang to drive a small PM speaker.

On the PC board there is a VFO buffer so you can route the VFO to the matching transmitter. Also, the three major sections of the receiver can be muted by removing the VCC line. All T/R functions are done on the matching transmitter board. I'll have a closer look at the transmitter down the road.

Assembly

With all components mounted on a single PC board, construction is fairly straightforward. Of course, the strange UK parts slow down the process a bit but there were no hitches in the assembly of the receiver. Although the Kanga kit comes with a trimmer pot for use as the audio gain control, put it in the junk box and use a panel-mounted pot. You'll also need a 20 to 50 pF variable capacitor for the local oscillator. I happen to have on hand a rather fancy dual reduction drive capacitor that I pressed into service. Dan's Small Parts also handles some vernier drive variable capacitors that will work quite well with this receiver. You'll also need a speaker and a box to install the PC board in. It's odd, but there are no mounting holes in the PC board. You can drill in some if you wish; there seems to be plenty of room. Or, you could solder the board directly to some copper mounting supports.

There were a bit more instructions and assembly information this time than I've seen in the Kanga kits I've assembled in the past. In fact, there's even a PC board parts overlay that actually makes sense. Also, something nice this time is having the voltages shown on a separate schematic of the receiver. I found these very helpful when troubleshooting the receiver the first time. The LCK-80 is not hard to assemble, but it's not for the neophyte builder, either.

Tune-Up

Tune-up is simple. It requires only a frequency counter and an RF source. First, you need to adjust the VFO frequency by tuning T3 for the proper frequency. As I mentioned earlier, I had some trouble with the combination of capacitance in the oscillator and had to do some playing around with some values before I got T3 to tune correctly. After you have the VFO set, inject a signal into the receiver; it might have to be fairly strong at first. An oscilloscope makes tuning up the front end easier than by listening to the signal on the speaker. Adjust T1 and T2 for maximum indication on the scope. Remove the signal source and connect the antenna to the receiver. Now you should be able to hear signals as you tune across the band. Since the receiver has no AGC, strong signals will cause the receiver to overload and distort the audio. You can add a brute force RF gain control by using a 500 ohm pot to ground on the antenna input.

With the receiver's PC board mounted in a case, it proved very stable considering that the oscillator is running at 8 MHz. The receiver can easily hear signals my Drake R8 can hear down in the noise. During times of busy band conditions, the filter of the LCK-80 does not provide the best selectivity, but it heads above any direct conversion receiver. The LCK-80 provides single signal receive.

When I get some extra time, I'll assemble the matching transmitter and marry the two together for a complete 80 meter CW transceiver. It should prove an interesting project. But, in the meantime, just listening to signals on a receiver you built with your own hands is a lot of fun.

Number 14 on your Feedback card

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Dayton Youth Forum

My opening remarks at the '94 Youth Forum at the Dayton Hamvention were most unconventional in format. Due to emergency back surgery, I was unable to be present at Hamvention this year. The terrific folks at DARA, and good friends like Bill Pasternak WA6ITF, Ron Moorefield W8ILC, Noel McKeown WB8QQC and Gary Matthews KB8GOL pulled off some extraordinary feats to make sure I could still "be there."

I was discharged from the hospital an hour earlier than we planned. While sitting in a friend's car right outside the hospital, I called the Hara Arena to inform them that I was on my way home and would have to miss the teleconference call we had arranged. In true ham tradition, they patched my cellular phone call through the PA system at the forum. It was an experience I'll never forget! I was actually able to welcome everyone to the forum in Dayton while sitting in a car in front of a New York City hospital. I'll have to be lowered in by a helicopter next year to top this one.

The very capable Noel McKeown stepped in to take my place as moderator. By all accounts he did a superb job with the very talented youngsters we had lined up. My thanks to the McKeown family for all their good efforts.

This annual Youth Forum is nearest and dearest to my heart. Interviewing the youngsters from all across the country begins as early as June and July. It's a privilege for me to be able to showcase the bright and accomplished children who make such a vital contribution to the growth of amateur radio.

My dear friend Roy Neal K6DUE was first up to speak to the audience about SAREX (shuttle amateur radio experiment). He spoke with pride about how this program has put ham radio in the hands of the astronauts so they can speak with school kids all over the world. Roy is a tireless worker for AMSAT.

The first youngster at the podium was Chris Rismiller N8PEM, age 18. He spoke of his participation with a local radio club in an emergency drill with a mock airplane crash. Chris is also very active with the 4H club and has done many radio demos for the other kids to see. He stressed that ham radio is more fun when you get involved with other friends your own age.

Ray Glazer AA8MR, age 16, spoke about how he was introduced to ham radio and ATV by taking part in a 1,000 ft. balloon launch. He became involved with a local ATV group that organized the foxhunt after the launch.

Kevin Sil N9RPL is 15 and told about some funny experiences with foxhunting. He explained triangulation to the audience, and how foxhunters utilize this technique.

As I watched the forum on the videotape that had been sent to me, I was really proud of the children who got up to speak in front of a packed audience. I was especially delighted when the distaff members of the speaking group got up to the podium.

Laura Sobon KD4OZC is 10 years old and has an Extra Class license. She's been listening to her dad's radio since the age of six. Laura gave a very impressive presentation, including a video that showed the rescue efforts for a tornado emergency that she and her dad participated in with radio communications.

Cathy Gilliland KBØFDU is a 17-year-old who is working with Bill Pasternak and Dave Black on a video about amateur radio as seen through the eyes of a young person. She also gives radio presentations at a local middle school for Hobby and Career Day.

Jeremy Boerger N8PPY intrigued everyone with his description of the devastation at the tornado relief center he worked at with his dad. He wisely remarked that "catastrophic events happen, and amateur radio can always be a backup."

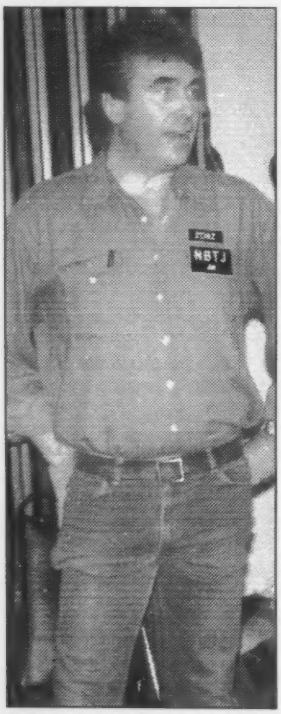

Photo B. N6TJ welcomes youngsters to join him when he goes to the Ascension Islands for DXing. (Photo by Jim Wilmerding N4MDC.)

Photo A. Presenters at the '94 Dayton Youth Forum. (Photo by Jim Wilmerding N4MDC.)

Seth Wilson NØURQ is 14 years old and is vice president of the Boulder, Colorado (BARC), Jr. Amateur Radio Club. He describes himself as a "people person." Ham radio gives him a chance to meet many different people and to learn about all of their interests. Seth teaches other youngsters about radio. The club provides 10 different Elmers, so the children get exposed to various teaching styles and different areas of expertise.

At this point in the forum, Noel and Bill drew names to give out the books that were donated by the ARRL for prizes.

Casey and Cody Haley have done several youth forums with me as my guest speakers. They are always a big hit. Cody KB5WYJ is 11 years old and really enjoys all aspects of ham radio with the rest of his ham family. He told about a geography bee that he won in school thanks to the knowledge he had gotten from his radio contacts. His dad, Marty AB5GU, helps out with radio demos to the Boy Scout group the Haleys belong to.

Photo C. Chris Lougee with the winner of the 2meter rig, Darren Ellington KB4FBC. (Photo by Jim Wilmerding N4MDC.)

Casey AB5RG is nine years old and got his Extra ticket when he was only eight. Besides winning numerous awards, Casey has the distinction of being the youngest member of DXCC. He "loves to chase DX." He introduced Jim N6TJ/ZD8Z, who made a sked with him from the Ascension Islands. Casey says that radio is really great for a kid because it has helped him with his geography, science, and social studies. It has also gotten him the day off to speak at the forum in Dayton.

My good friend Gordon West WB6NOA was up next to invite everyone to join us both on "The CQ All Schools Net" next fall. (We meet on Tuesdays and Thursdays at 17:30 UTC on 28.303 MHz. If nothing is heard after 10 minutes, go to 21.303 MHz.)

Shawn Pattison KB4WXY, age 13, told the audience how he became interested in ham radio after seeing a demo in the second grade. He enjoys getting involved with the public service part of the hobby and recommends that youngsters get exposed to working with emergency communications.

Toby Metz KB7UIM, age 14, was fortunate enough to have his trip to Dayton sponsored by the local Boise, Idaho, Amateur Radio Club. This articulate young man gave a wonderful multimedia presentation highlighting his running of the Discovery Net. He was the net control for the SAREX STS-60 school contact. Over 25 other schools were linked up for the 10-minute contact with the astronauts. Over 19 questions from school kids were answered during the contact. The ever-popular "How do you go to the bathroom in space?" question went unanswered.

Danny Savino AA2GM is a 13-year-old Extra Class whose dad first interested him in amateur radio by showing him different QSL cards. Dan spoke about how to get young people interested in radio. He mentioned that foxhunts, moonbounce, space contacts, and working different modes are activities that provide action and excitement, which is what young people like. He proposed a youth net or a school club as good ideas to get large numbers of kids involved.

The grand finale of the Youth Forum came when Chris Lougee of ICOM drew a card out of a hat to present an ICOM 2 meter handie-talkie radio to a youngster under the age of 18. The winner was Darren Ellington KB4FHC.

It seemed to me from watching the videotape that a good time was had by all. My special thanks to all the children who turned out to be such excellent presenters, and to all the wonderful hams who pitched in to help with the forum.

Due to the large number of children who applied to participate in this year's forum we'll be starting to interview a lot earlier for Dayton '95 this year. So all you teachers and instructors and parents . . . keep your eyes and ears open for articulate, active young people who would like to be interviewed for next year's forum. Have them contact me at (718) 983-1416.

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
PO Box 2508
Fullerton CA 92633

RACES RDF Goes High-Tech

You can learn a lot from a book or a lecture, but you can't master a skill without repeatedly performing it yourself. Otherwise, we would all be professional musicians after a few hours of just reading sheet music and listening to CDs. There's no exception to this rule when it comes to acquiring radio direction finding (RDF) expertise. Over the last 68 installments, "Homing In" has helped you select equipment and has described techniques for hidden transmitter searches (called foxhunts or T-hunts). But the only way you will become an expert at it is to get some experience, by tracking down actual signals.

Three years ago, the Radio Amateur Civil Emergency Service (RACES) team for the County of Orange realized that rapid response RDF skills could be vital to the public agencies it serves. At the time, there were many regular T-hunts in Southern California, but most participants in them had years of experience. Existing hunts were usually too difficult to inspire confidence in beginners, so RACES members began holding their own monthly hunts. Liability concerns prevented them from calling these events official RACES drills or functions, but the group's leadership heavily promoted them.

RACES hunts are still held monthly on the 146.895 MHz W6KRW repeater, immediately following a Monday evening net. All listeners are invited to try their hand. The first hunt was extra-easy—just a mobile station "hidden" in plain sight in the parking lot of a popular coffee shop. Hider WA6LAB gave enough clues and encouragement that several hams were able to find him with only a mobile rig and a whip antenna, by gauging the strength of the signal. (This is commonly called "hot/cold" hunting.)

WA6OPS and I hid the second RACES T-hunt, trying increase the hunters' skill level. Our T was a dual-band hand-held modified for cross-band repeat operation, in a black box under a tree next to the curb of a dead-end street. Despite our continuing words of encouragement via the UHF link from our car a block away, hunters would drive up next to the tree, then drive away when they didn't see a ham in a car there. A few hunters complained that the hunt was "too difficult."

Now They're World Class

It's completely different today. These RACES hunters have kept at it, and their skills are as polished as the participants in the Southern California "expert" hunts. Nowadays, they love going on foot to "sniff" out concealed rigs at the end of the mobile portion of the hunt. For the most recent event, KE6AFR and KE6DVB stuffed their rig in a big bush under high voltage power lines. Their antenna was a quarter-wavelength bronze rod concealed inside a hollowed-out branch.

Members of the RACES RDF group have started two additional monthly events. One is a "progressive" hunt, where the first to find the T gets to immediately go out and put his own T on the air in a location of his choosing. The finder of the second T hides transmitter number three, and so on for the remainder of the evening. Another hunt features several T's, each beeping intermittently on the same simplex frequency from widely scattered locations. The first to find all of them wins.

T-hunting has boosted the spirit and camaraderie of this RACES team. Members gather informally at lunchtime several days a week to swap hunt stories, plan events, and draw new RDF equipment ideas on paper napkins. The newest gizmo on the RACES hunt scene (Photo A) is "T-Helper" by Robert Barris KD6IFZ, who loves both ham radio and digital technology.

According to Robert, "I started playing with microcomputers when I was in the fifth grade, learning on a Radio Shack TRS-80 Model 1. I wrote little programs in BASIC, played games and whatnot. From there it was the Apple II, then the IBM and now the Macintosh."

In 1986, Robert's computer acumen led him to a job at Quicksilver Software, where he and others write programs under contract for numerous computer brands. There he met Dave Steffen N6TCI and Byon Garrabrant KD6BCH. "They both got into ham radio and then joined RACES," he says. "I went on a couple of T-hunts with them, which got me interested in ham radio. I got my license about two years ago."

Most 2 meter mobile transmitter hunters in Southern California use rotating beams or quads to take directional readings. They use an RF attenuator to keep strong signals from pinning the receiver S-meter. Robert's T-Helper automates the process. It captures antenna mast azimuth and S-meter readings and feeds the data to his Macintosh PowerBook 180 laptop computer, which displays real-time polar plots of signal strength versus direction relative to the car's heading (Figure 1).

As the vehicle moves along and Robert manually rotates his RDF quad (Photo B), the display updates constantly. Old traces fade into the background, replaced by fresh information. KD6IFZ and his partner can easily tell which signal lobes are consistent and which ones come and go due to reflections from nearby hills and buildings.

T-Helper automates the job of setting the RF attenuator as the hidden T

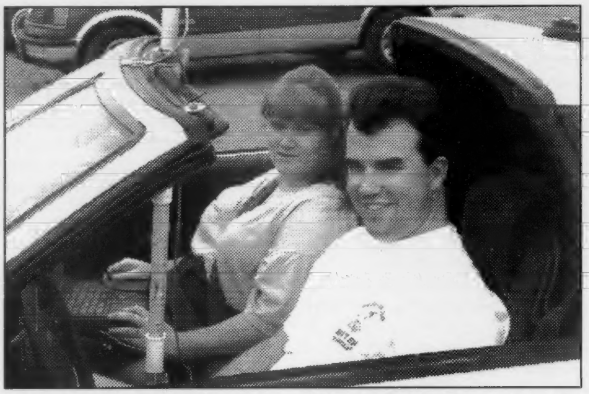

Photo A. Robert Barris KD6IFZ goes on hidden transmitter hunts with Rachael Kent KE6GIO. His T-Helper interface board and automatic attenuator are in a cardboard box on the back seat with the battery.

Photo B. Robert drives and turns the 2 meter quad while Rachael operates the computer. According to Robert, "She's an excellent navigator, very good at reading the maps."

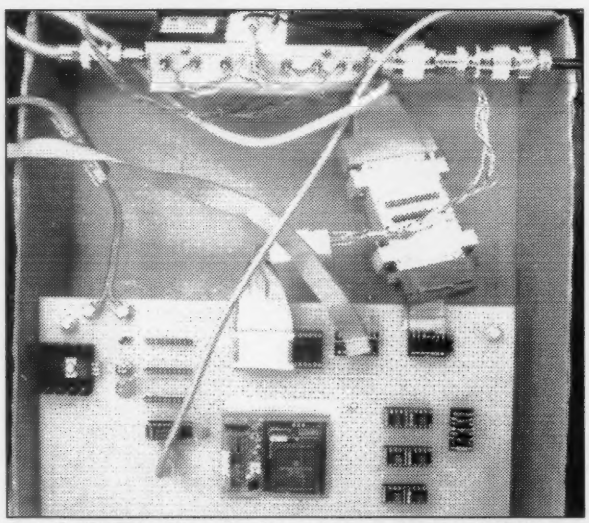

Photo C. KD6IFZ is still experimenting, so he has not boxed up the T-Helper as yet. The microcontroller module is in the center of a large piece of perf board, with analog S-meter voltage coming in to the left of the module. At the top of the photo is the surplus digitally-controlled RF attenuator from JFW Industries.

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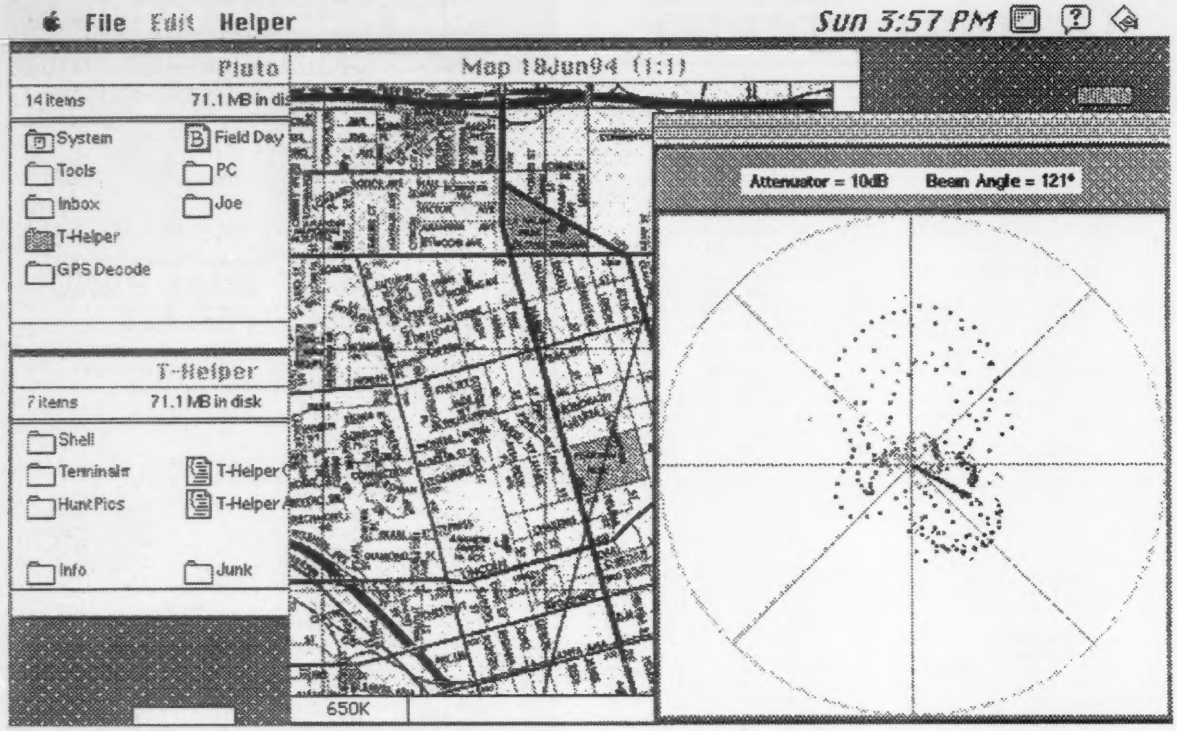

Figure 1. A typical display on KD6IFZ's computer during an actual T-hunt. Quad pointing direction (121 degrees relative to vehicle heading) is shown as a short dark bar in the polar display.

is approached. When signal level increases enough to drive the polar display off scale, Robert's program commands his attenuator to knock the signal level into the receiver down sufficiently to bring the display back into range. If terrain features suddenly block the signal or if the hider reduces transmitter power, the program reduces the RF attenuation.

A header bar on the 300 x 300 pixel polar display window tells the current antenna azimuth and attenuator setting. There is plenty of additional room on the PowerBook screen, so Robert added a map display. A separate window shows a portion of the county street map. The map is easily moved under the window to center it on the vehicle's location.

Affordable Data Acquisition

The T-Helper interface board (Photo C) is designed around a Motorola 68HC11 8-bit microprocessor. "It is a great chip for only about 20 bucks," KD6IFZ says. "I use a support module from CGN Company. The module is intended primarily for prototypers and people building onesy-twosy projects like me. It has a socket for the 68HC11, a crystal and a 5V-to-12V level shifter for RS232 interface. It also has all the necessary reset support circuitry, which is pretty tricky to get right on your own. That little $35 module is a computer in itself.

"The 68HC11 has analog-to-digital converters right on the chip. I'm using one of them to digitize the receiver S-meter reading. The meter circuit in my receiver puts out 0 to +5 volts, so it's a perfect match. There's no algorithm or smarts in the 68HC11 module, just a simple data acquisition process. The chip has a bootstrap mode. When you first turn it on, it watches its serial port. The host program in the PowerBook feeds it a little 180-byte routine at 9600 bits per second. The module loads it and runs it."

Antenna position data comes from a shaft rotation encoder attached to the bottom of the mast (Photo D). Robert explains, "The encoder has 2,000 counts of resolution, more than I can plot. What's more, determining shaft angle requires a rather hairy algorithm. The encoder does not give a nice 10-bit answer of which way the shaft is pointed. Instead, it has two outputs, called the A and B channels. Each generates a precisely timed square wave when the disk is turned. It's the same principle as the quadrature output encoders in a mouse."

Since the encoder output is relative, not absolute, the 68HC11 must read data continuously and keep track of the shaft position. "If you lost data, you would lose sync," says KD6IFZ. "But I've never had a problem that I could attribute to the encoder losing count."

Rather than using a PIN diode RF attenuator with analog input, which would have required a digital-to-analog converter module in the T-Helper to drive it, Robert looked for a digitally-controlled attenuator. Luckily, he found a suitable unit, made by JFW Industries, at a swap meet. "We weren't sure it was going to work on the 2 meter band," he says, "because it was designed for microwave frequencies, judging by the SMA type connectors on it." But he wrote a program to test it and determined that range and accuracy was good enough for this closed-loop application.

The "intelligence" for KD6IFZ's system is all in the host program, which runs in the PowerBook and communicates with the T-Helper board via a communications port. The operator can control many attributes from the keyboard, such as the rate that traces fade away. At startup, an initialization routine asks the operator to point the beam straight ahead and hit a key. The computer then automatically calibrates the shaft encoder output.

Reprogramming on the Run

Robert knows his program forward and backward, and he sometimes makes changes and recompiles it in the middle of a T-hunt. When taking photos of the setup, I asked if he could make the dots on the polar display bigger, so they would be easier for readers to see. After a couple of minutes of recoding and recompiling, the display had bigger dots. For night hunts, Robert prefers white dots on a dark background, which he can get with a

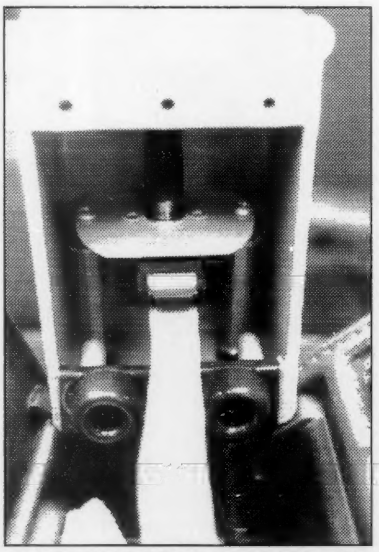

Photo D. A flexible hose connects the bottom of the rotating antenna mast to a shaft rotation encoder from US Digital Corporation. A permanent coupling is not necessary, because the computer calibrates the encoder readout before the start of the hunt.

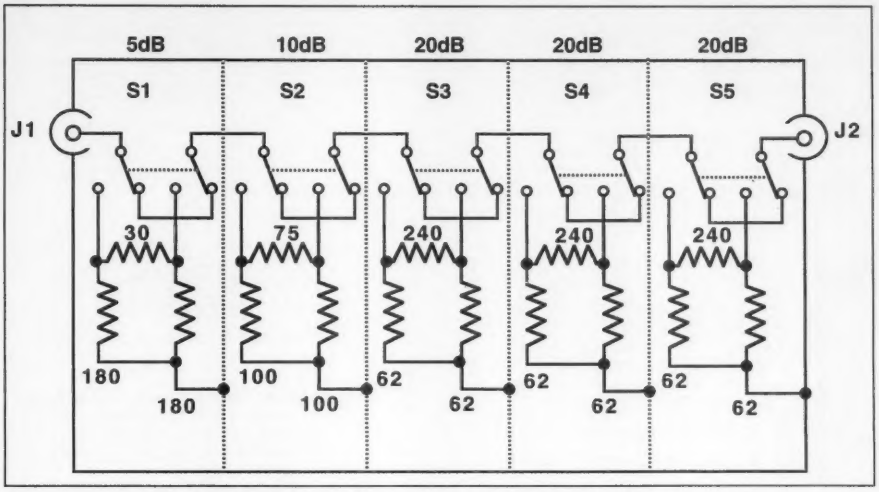

Figure 2. Corrected schematic for the resistive RF attenuator project in July's "Homing In."

few keystrokes.

When hunting, the host program loop sequence is simple: Read the antenna shaft angle, read the S-meter voltage, place the dot on the polar display, check if the S-meter is in range and reset the attenuator accordingly, then repeat. "The protocol between the host and the helper is very simple," says KD6IFZ. "The host sends out one character to assert a byte on the attenuator control lines. The character also serves as the go-ahead to send back a packet of azimuth/strength data from T-Helper to host.

"This happens about 30 times a second. There are six optoisolators connected to output pins on one of the parallel ports on the 68HC11. Every time the microcontroller receives a byte from the host, it asserts it on the six lines and the relays in the attenuator change to reflect it.

"The T-Helper board runs directly off a 12V gel-cell," Robert adds. "The computer has its own battery that lasts about two hours on a good day if you're not stressing the machine too much. We bring an inverter and the computer's battery charger along. When the battery gets low, we plug in the inverter and charge it up again."

Robert and Rachael won't brag, but the computerized system has served them well in the 10 or so hunts where they have tested it. "We haven't yet won any hunts where winner is determined by low mileage," he says. "But we won the first Monday night first-finder-wins RACES hunt that we took it out on. On that hunt, KD6BCH hid using a continuously rotating beam antenna for transmitting. The T-Helper worked like a charm.

"The other hunters had to contend with S-meter readings constantly varying 10 to 15 dB, which made accurate bearing-taking difficult for them. With the T-Helper, we could build up a pattern on the screen. As we swept the antenna slowly across the signal and let the peaks and valleys come and go, the pattern showed where the highest high was, which was the direction to the T. That was instrumental to our winning."

Always a Wish List

Like any good engineer, Robert is planning additions and improvements to his system. "I have to constantly remind myself that I didn't build it to win T-hunts, but to learn how to do some electronics," he says. "But I'd like to add a satellite navigation unit to know where I am, and a flux-gate compass to input the exact vehicle heading to the computer. Another feature I'm thinking of adding is a B-scope (rectangular X-Y) display, simply because it's sometimes easier to find the peak with it, compared to the polar display."

What about letting the computer calculate the best bearing direction from the displayed data? Robert thinks that some things are best left to the operator. "Judging by some of the patterns that we have gotten, I wouldn't trust the computer to make judgement calls on where the peak is," he says. "We prefer to keep moving and keep swinging the beam. If we see a strange blip, we can tell if it was or wasn't there before and decide whether to change direction or keep moving.

"I'm very much against the computer doing any interpretation. I like the program to have lots of ways to present the data, but ultimately it comes back to the human looking at it and making choices. That's also one of the reasons I'm against having a motor drive for the antenna rotation. Often we get into a situation where it's definitely in the front right quadrant, for example, and we want to just focus on that area for a while. We don't want to swing the full 360 degrees all the time."

Orange County RACES is full of technically competent hams, and KD6IFZ insists on thanking those that assisted him with the T-Helper project. "John Roberts WA6LAB was great for general consultation," he says. "He gave me some parts and got me started on the first circuit, to buffer the S-meter output from the radio. Mel Chester KB6MT loaned me his 6811 evaluation board to test my concept before I bought a chip and started building this thing. David Hess KD6LZA and Marty Mitchell N6ZAV gave lots of electronic assistance. By-on Garrabrant KD6BCH helped me a lot with the software."

And Finally . . .

Ooops . . . The *73* gremlins accidently shorted-out the DPDT switches in the resistive RF attenuator project in "Homing In" for July. A few extra connection dots crept into the circuit. Figure 2 is a corrected schematic.

Hardware and Data Resources Mentioned in this Article

CGN Corporation
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(408) 720-1814

JFW Industries, Inc.
5134 Commerce Square Drive
Indianapolis IN 46237
(317) 887-1340

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PACKET & COMPUTERS

Digital Amateur Radio

Jeffrey Sloman N1EWO
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Getting Your Computer On The Air

This column usually discusses advanced topics, but even the most advanced among us started out with simple stuff. With that in mind I'd like to get more of you on the air so we can build up the pool of "packet experts."

Many of you with an interest in packet radio are already using your computer to communicate over phone lines using a modem. Sending and receiving data using amateur radio gear shares many of the concepts you already understand from the wirebound world of BBSs. If you are an experienced landline BBS user, you already own one critical component. If you are an average ham, you've got another—a 2m handheld. In fact, for many of you, the only thing that you'll need to buy is a TNC (Terminal Node Controller) which is the packet radio equivalent of your modem (but it's a lot smarter.)

What Do You Need?

The first thing you'll need to start out in packet is some sort of terminal. This can be a "dumb terminal"—an old-fashioned desktop unit often found at hamfests for anywhere from $0 to $20. Almost any dumb terminal will do, *but* not every terminal will work. Ideally, you want something that works as a "glass TTY" (a video version of a printing terminal) or VTxxx emulation, where xxx is 52, 100, 102, 220 (or higher). The VT terminal is an invention of DEC (Digital Equipment Corporation), and is just a little better than dumb. By sending a VT terminal certain command sequences you can get the display to do some interesting things like menus and reverse video, The higher the number after VT, the more modern and capable the terminal.

While a terminal will get you on the air, you'll find it frustrating after awhile. A terminal cannot run the sophisticated communications software that adds to the excitement after you get going. For this, you'll need a computer. Almost any computer can be used in a packet station. If you have a Commodore 64, 128, or Amiga, you'll find lots of other hams using this hardware and ready to offer help. If you use a Macintosh, you'll find plenty of software for your machine. The clear leader, though, in the amateur world will come as no surprise—The IBM-PC and its compatibles.

Just like the rest of the world, hams use the IBM-PC in greater numbers than any other machine. So if you don't own a machine, and you want to buy one for use in our shack—buy a PC. What sort of PC? Well, your best bet is to buy something that will properly run Microsoft Windows. Windows-based ham software is rapidly becoming the norm and offers wonderful ease of use. Basically, you'll want an 80486 with 8 Mb of RAM. Note that this is a very simplistic description, and you'll want to consult an expert (friend or dealer) for a more complete explanation.

Whichever machine you have, you'll be using one of its serial ports to connect the next box in the chain—the TNC. A TNC does two things for you. First, it has some intelligence built in. This allows it to interact with you through its simple user interface. For instance, to connect to another station, you type a command at the prompt:

cmd:c kb9bwe

This instructs the program in the TNC to do everything necessary to make a connection to KB9BWE. To do this it uses a special "protocol"—a set of rules—called AX.25. This is a "packet switched" protocol, and where packet radio gets its name.

Because of this built-in protocol and its "command interpreter"—the part that understands your commands—any sort of communications program will start you out.

The second major function of the TNC is to provide a modem that gets your data on the air. The word modem comes from MODulate DEModulate, and its job is to turn the outgoing digital signal into sound and the incoming sound back into digital information. It functions about the same way that your telephone modem does, but usually at a considerably slower pace of 1200 baud.

Let's take a moment to look at the idea of "baud." This technical term comes from the name of J.E. Baudot, a French engineer who did work on the telegraph. There is confusion about just what "baud" means—it is not the same as bps (bits per second). A baud is a transition from on to off, or logical false to logical true (0 or 1). When we say that a modem is capable of transmitting data at 14,400 bps, we are not saying that it is a 14,400 *baud* modem. The carrier for a 14.4 kbps connection is actually 9600 baud. Thanks to some fancy slight of hand, it is possible to send more than one bit per baud—get that? The modem sends more than one bit of data each time it makes a transition from high to low.

Now, this doesn't mean that you *have* to send more than one bit per baud, and in fact, in the average TNC 1200 baud = 1200 bps. This is somewhat slow for file transfer, but does OK for reading bulletins and keyboard-to-keyboard connections. More hams are looking at higher speed connections, though, and 9600 baud modems in TNCs are more popular than ever.

Choosing a TNC

TNCs come in a range similar to terminal equipment. On the low end are the simple TNC2 (a standard TNC design from TAPR, the Tucson Amateur Packet Radio group, which was greatly responsible for making packet a practical reality). These units can be found at hamfests for less than $100, sometimes considerably less. They can be purchased new for $100 and up. Good units to look for include the AEA PK-88 (and the internal version the PCB-88) probably my first choice in the low end, the Kantronics KPC-4, a nice small unit that is easily powered by a battery for portable use, and the MFJ 1270 which is truly a budget box—not my first choice but it will work and has many happy owners.

It is *very important* to be sure that any TNC you buy at a hamfest is a TNC2 and not a TNC1. While the firmware (on a PROM in the box) can be upgraded on many of these units, it is not the best way to start out your packet carrier unless you have help. Any *new* TNC will be TNC2-compatible. Any of these inexpensive and simple units will get the job done for the beginning packeteer. Once we get past the entry level, though, things start to get very interesting.

Multimode Controllers

Many of you may have your sights set on HF operation and all those esoteric modes like AMTOR (AMateur Teletype Over Radio) and PACTOR (A combination of Packet and AMTOR), or even just plain old RTTY (Radio TeleTYpe). To do these things, you'll need a multimode controller. Multimode boxes come in a wide variety, and choosing one is not a simple matter. I'll give you this advice, though: If you care about HF, buy an AEA unit. AEA is undoubtedly the best in the HF arena with its eight-pole Chebychev filter in the front end. If you want to work digital HF, look for a multimode controller.

The Radio

A transceiver replaces the phone line in our packet connection, and a good radio system is very important to packet operation. The AX.25 protocol uses a traffic control scheme called CSMA/CD (Carrier Sense Multiple Access/Collision Detection). It works a lot like 2M repeater operation:

Carrier Sense—listen before you key up.

Multiple Access—more than one station uses the same frequency

Collision Detection—"hey, you guys doubled"

Because this scheme depends upon all stations on the LAN (Local Area Network) hearing each other (Carrier Sense), your radio must match your LAN. In some places, you just won't get away with less than 50W. This happens when outlying stations make themselves part of your LAN. In order for them to reach stations—usually PBBSs located far from them but close to you—they run high power. This means that even though you could make a good connection with 5W to the station you want to talk to, others on the frequency will not know you are transmitting and will interfere. It is usually possible to find a frequency which supports truly local operations, for those that which to (or must) use handhelds and other low powered radios.

Antenna Selection

I said earlier that you needed a good radio "system." This includes your antenna. If you are inside a LAN service area, you must use a good omnidirectional antenna. For the all-important Carrier Sense part of the AX.25 protocol to work properly, you must hear them and they must hear you. "They" being *everyone* using the frequency, *not* just the station to whom you wish to connect. The fact is, a good antenna can make a dramatic difference in a packet station's performance. I have had a great deal of success with a handheld into a Ringo Ranger at 25 ft., and a great deal of frustration with the same rig into a half-wave mag mount when it was all I could manage. The Ringo is a good choice, or, if you can spend the money, the Fiberglas co-linear designs from Diamond and Comet are simply great. Whichever antenna you buy, follow the mounting and tuning instructions carefully to insure a good VSWR.

What About a Beam?

Directional antennas may seem an attractive alternative to the omni, but they present a problem: Unless you intend a point-to-point link, and your antenna has an amazingly small beam width, *you are going to interfere with other stations.* There is one exception to this: If you live on the fringe of a LAN, and no other LAN user lives behind you (relative to the service area) or nearby to the sides of you, you can point a relatively wide beam toward the LAN. This can and does work in this case, and I am sure that some of you will be able to take advantage of this advice.

Get Help from your Local Hams

The final piece of advice is to seek out a friend in your town, or join a packet radio organization. There is no shortage of help out there, hams love to help others get started in their favorite part of the radio hobby. I'd like to help hams get in touch with individuals or clubs who can help a ham start up with packet. If you are such a person, or belong to such a club, write me on the Internet: jsloman@bix.com and let me know what your up to—I'll let others know here.

ATV

Number 19 on your Feedback card

Ham Television

Bill Brown WB8ELK
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Big Shanty ATV

The Big Shanty Repeater Group operates a wide-coverage ATV repeater on top of Sweat Mountain just north of Atlanta, Georgia. Thanks to the efforts of Ralph Fowler N4NEQ and others in the group, this repeater offers a variety of features such as NASA Select (during Space Shuttle missions), weather radar and a number of live camera views from the top of the mountain. To alleviate the problems associated with an increasingly crowded 70cm band, they elected to go with a crossband repeater with an input of 1255 MHz (FM-TV) and an output on 427.25 MHz (cable-ready channel 58). Although there are quite a few ATVers with transmit capability on 1255 MHz, a much larger audience exists who like to watch the fun with very modest receive equipment (some using cable-ready VCRs hooked directly to a small antenna).

To improve the success of these viewers, the group embarked on a couple of projects to help stir up interest in the repeater. The first project was a small but very effective (and inexpensive) antenna designed by Kip Turner W4KIP that was made out of hog fence material. It was dubbed the "Hawg Fence" antenna and is in use by a large number of the Big Shanty group (construction details for the Hawg Fence will be given in an upcoming column).

In order to overcome inherent feedline losses and to help improve reception with cable-ready VCRs or TVs, Will Payne N4YWK developed a mast-mounted preamplifier that he dubs the "Hawg Amp." The following are Will's construction details for what has to be one of most cost-effective mast-mounted preamps you'll likely encounter.

The Hawg Amp

The heart of the Hawg Amp system is a Ramsey Electronics PR-40 preamp kit. Although it performs a bit below the more expensive and delicate FET types, this bipolar preamp offers a very respectable 10 dB (13 dB typical) gain, along with a noise figure of 1.2 dB (90 deg. K). It has a 3 dB bandwidth of 24 MHz (we measured 40 MHz) and operates with a supply from 8 to 16 volts with a current drain of 7 mA. The preamp's transistor is a 2SC2498 NPN and is equivalent to an ECG10 or SK9139. The real secret of the Hawg Amp system's success is to place the Ramsey preamp up at the antenna to eliminate the feedline loss. To avoid running extra wires to send power to the preamp, the preamp was modified to allow it to draw DC power from the center conductor of the coax cable. To accomplish this you will need to build a DC power injector (see Figure 1). You can think of a DC power injector (located in your shack) as a simple duplexer for two bands (DC and RF)—it allows you to put DC power into the bottom end of your coax without interrupting the received signal path.

Theory of Operation

In the original Ramsey preamp (refer to the schematic that comes with the Ramsey kit), the input from the antenna is applied through capacitors and inductors to the base of Q1. These input components form a UHF tuned impedance match from the input to Q1. Q1 amplifies the signal. Capacitor C4 couples the amplified signal from Q1 to the output. Resistors R1 and R2 set the bias on Q1 to draw about 7 mA of collector current, which is its best operating point. Capacitor C5 keeps the DC supply clean.

The Hawg Amp modified design takes DC power from the coax. Since the coax center conductor has 12 volts DC on it, R1 is connected right to the center conductor. Capacitor C4 lets the amplified RF bypass R1 to the output coax without being attentuated. Capacitor C5 is no longer needed here and the "DC duplexing" is built right into the collector circuit of Q1. At the indoor end of the coax (inside of the DC power injector), C5 keeps the DC clean in the power injector. Choke L2 couples

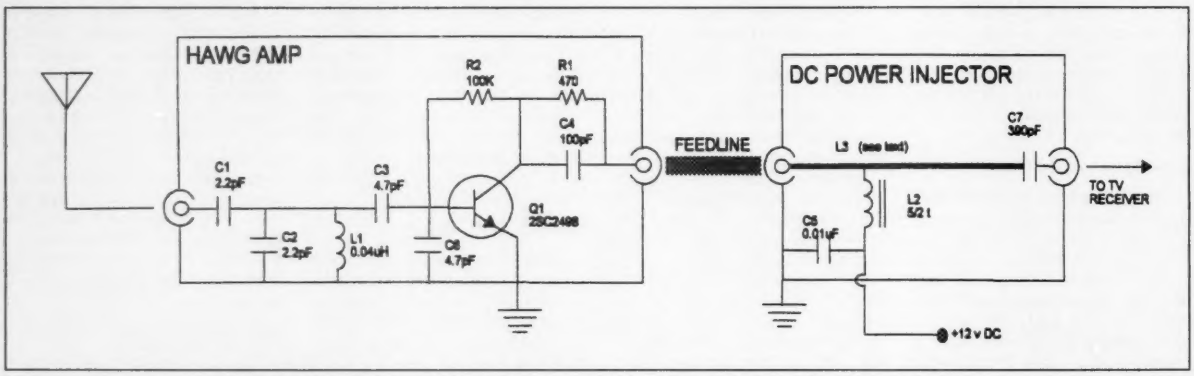

Figure 1. Schematic diagram of the modified Ramsey PR-40 preamp and the Hawg Amp DC power injector.

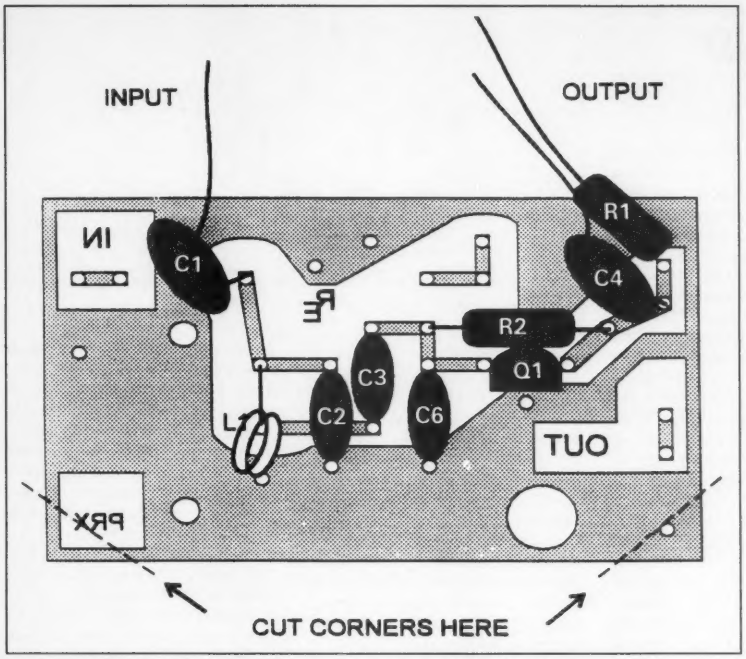

Figure 2. Parts placement of the modified preamp showing flying component leads.

the DC into the coax while blocking RF and capacitor C7 allows RF to pass through to your receiver while blocking the DC (many receivers don't like to see DC on their inputs).

Hawg Amp Construction

Build the Ramsey PR-40 preamp kit as shown in their instruction manual with the following exceptions: Install only one side of components R1, C1 and C4 to the circuit board. The other lead of each component will be left flying rather than using the PC board holes (refer to Figure 2 for details). These will be the leads for DC power, RF in and RF out. Do not install C5, it will be used for the power injector circuit.

Although you can use any case of your choosing for the preamp and the power injector, surplus CATV tap boxes, each having three F-type connectors were used to house the antenna-mounted preamp and the power injector. Desolder these tap boxes and remove their PC boards and at least one of the F-connectors. Save the F-connectors and one of the ferrite core baluns for use in the DC power injector. Remove the windings from the existing balun and rewind 1-1/2 turns of magnet wire through the holes of the ferrite core as shown in Figure 3. Then assemble your DC power injector as shown in Figure 4. Solder L3, a piece of heavy bare copper wire from the center conductor of the IN connector, straight towards the center conductor of the OUT connector. Cut L3 about 1/8" short of the OUT connector. Install C7 to bridge the gap from L3 to the OUT connector. L3 and C7 should run in a straight line about 1/8" from the metal wall to form a transmission line.

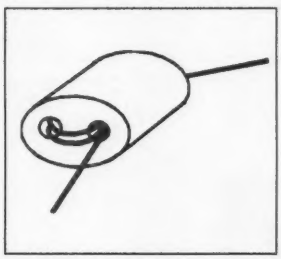

Figure 3. Balun winding details.

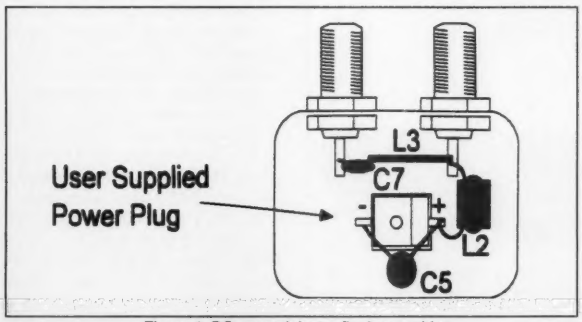

Figure 4. DC power injector final assembly.

Solder the ground lugs of the F-connectors to the bottom side of the Ramsey preamp and install the board and connectors into your case (you may have to cut the corners of the PC boards shown in Figure 2 if you are using a CATV tap box). Next, solder the flying leads of the preamp (C1's lead attaches to the Input connector; C4 and R1's leads attach to the Output connector).

Tune Up

Make sure you're getting the proper DC voltage from the DC power injector. If correct, hook it up to your preamp and attach your antenna to the preamp and check to make sure you're drawing around 4 to 10 mA of current. While observing a weak TV signal (P2 or P3 signal level to start with to find the best peak), adjust L1 by spreading or squeezing together its turns with a plastic tool until you observe the best picture. When adjusted, install your case's lid and get ready to install the preamp at the antenna. You can weatherproof your Hawg Amp by mounting it with the connectors down with a small cup or plastic container for a rain cover. RTV silicone rubber makes a good rainproof sealant if you leave a small opening at the bottom of the box. If everything is operating correctly, you should now have a noticeably improved received signal.

If you'd like a kit of hardware components and detailed construction information for the Hawg Amp (CATV tap boxes, magnet wire, 390 pF capacitor (C7) and necessary hardware—$10; everything including the Ramsey PR-40 preamp—$30), send a check or money order to Will Payne N4YWK at 2823 Oak Hills Dr., Dallas GA 30132.

ATV Net

If you are in the greater Atlanta region, feel free to check in with the Big Shanty Repeater Group. A weekly ATV net operates every Thursday evening around 9 p.m. EDT. ATV talk-in frequencies are 144.34 MHz simplex as well as the 146.655 (-600, optional 118.8 Hz PL) repeater. 73

ABOVE & BEYOND

VHF and Above Operation

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Loran Operation: Basic Principles

Last month I had a lot of information on 10 GHz operations to cover before the ARRL 10 GHz contest took place. For me, this is the premier microwave contest (I suppose just because I have fun participating in it). The 10 GHz contest is held on two separate weekends: the first in August; the second about four weeks later, in September. Operation is portioned to these two weekends to equalize the opportunity for those participating from all parts of the country. I try to work both weekends, although there have been weekends in the past where no amount of power worked, because of bad days for excessive path loss. Thank goodness for another day's attempt—it was much better.

This month I'll continue discussing Loran system operation, and cover in detail how the Loran system functions and what benefits it can offer to us as amateurs. Loran, or, more properly, LORAN, stands for LOng RAnge Navigation. As I discussed last month, as amateurs we don't need the navigation aspect of Loran in our activities, with the exception of using it to compute precise grid square location information. Loran provides a useful calibration method for our home frequency counters. I briefly covered this application for frequency control, showing how to compare the onboard Loran receiver oscillator referenced to the high accuracy standards at the Loran transmitter site. I will get into this aspect of frequency accuracy later; for now, let's get into what Loran is and how it functions.

The best description of Loran I can find comes from a paper from the National Institute of Standards and Technology in Boulder, Colorado, by Michael A. Lombardi of the Time and Frequency Division (the document is a contribution of the United States Government and not subject to copyright.) I must thank the author for his simple explanation of system operation, and NIST for making this document available.

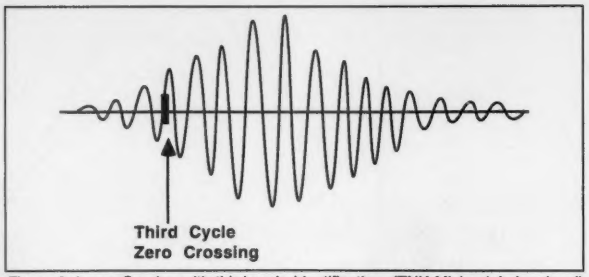

Figure 2. Loran-C pulse with third cycle identification. (TNX Michael A. Lombardi, NIST.)

Loran-C Operation

The Loran-C navigation system consists of nearly 20 synchronized "chains" or networks of stations. These chains provide coverage for most of the U.S. Canada, Europe, the North Atlantic, the islands of Central and West Pacific, the Philippines and Japan. Each chain has a master station and two to four slave stations; M designates master, and W, X, Y and Z designate slave stations. The master station transmits groups of pulses that are received by the slave stations, then they transmit similar groups of pulses.

All Loran-C stations (transmitters) broadcast on the same carrier frequency, 100 kHz. Because of this the receiver has to distinguish between signals from a number of different stations. Each chain is identified by a unique Group Repetition Rate, GRI. The length of the GRI is fixed and each chain is named according to its GRI (divided by 10). For example, the 7980 chain has a GRI of 79,800 microseconds. This means that every 79,800 microseconds (approximately 12 times a second) each station in the chain transmits a group of pulses.

The GRI must be long enough for each station in the chain to transmit its pulses and to accommodate for spacing between the pulses. The master station transmits eight pulses separated by a 1,000 microsecond delay. Then, 2,000 microseconds after the eighth pulse, a ninth pulse is sent. The ninth pulse is used to identify the master station. Next, 1,000 microseconds later, the slave stations send their pulses in turn. Each slave transmits eight pulses, separated by a 1,000 microsecond delay. For navigation operation, reception from the master and two slave transmitters is required.

The signal from each Loran-C transmitter radiates in all directions. Part of the signal travels parallel to the earth; it's called the ground wave. Part of the signal is radiated upward and is reflected off the ionosphere; this part is called the skywave. Receiving the skywave is less desirable than receiving the ground wave, because the skywave "moves" around and produces a less stable frequency (at the receiver). This movement is caused by the motion of the ionosphere and is due to the rise and fall of the sun. If you use the skywave for frequency calibrations, accuracy may be less than 1 x 10 to the tenth per day or less (optimum conditions). You will receive the skywave only if the ground-wave signal has traveled a long distance and is too weak and noisy for the receiver to track. If a receiver is within 1,500 miles of a Loran transmitter you should be able to receive the ground wave. (If you have a receiver that can tune to 100 kHz, the Loran sounds just like machine-gun-like chatter, which is it's pulse string and slave transmitters.

The Loran-C receiver is specially constructed to look for this pulse format and it can distinguish between the skywave and ground-wave signals. It does so by tracking the third cycle of a transmitters pulse. The third cycle arrives early in the pulse train, making it easy to discriminate and arrive at predictions based on this third cycle. In other

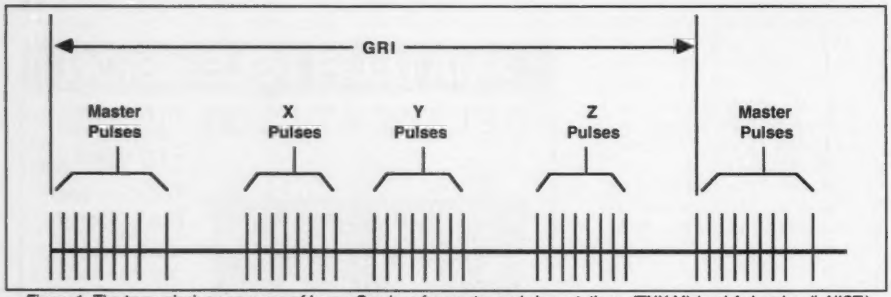

Figure 1. The transmission sequence of Loran-C pulses for master and slave stations. (TNX Michael A. Lombardi, NIST.)

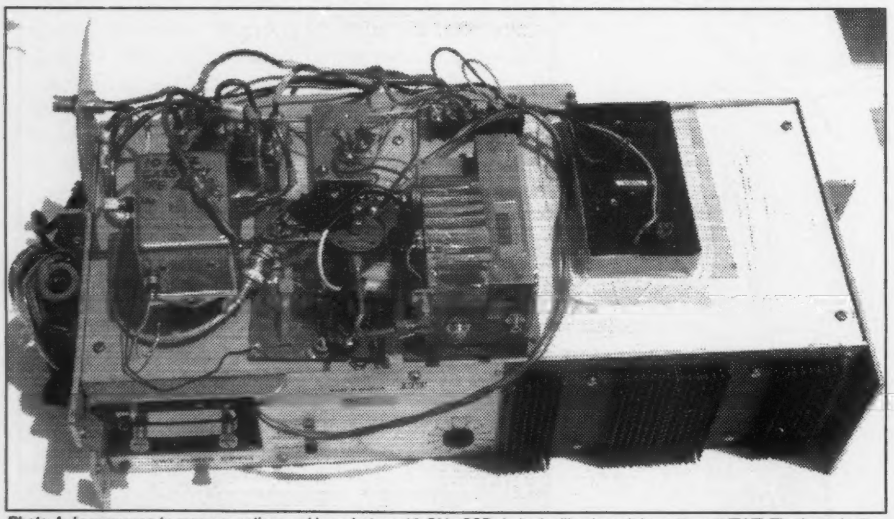

Photo A. In response to many questions asking what my 10 GHz SSB rig looks like, here it is: a 10 watt TWT. The large bottom unit is the power supply for the TWT. The top unit consists of two preamps, a brick oscillator-mixer, and four coaxial relays.

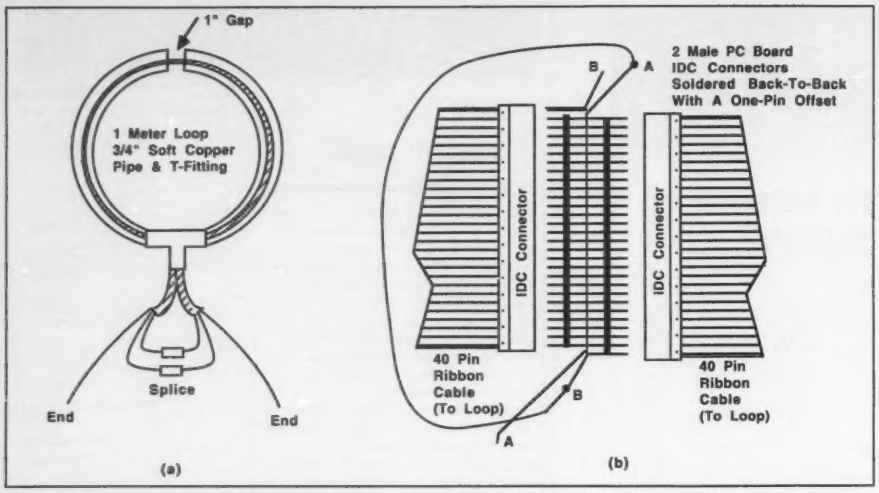

Figure 3. Construction ideas for a shielded loop antenna for VLF operation: (a) requires 40 splices, (b) requires simpler IDC connector with 2 male chassis IDCs soldered back-to-back, 1-pin offset.

words, if the pulse is of sufficient quality we can be fairly certain that it is ground-wave. Secondly, the third cycle has more amplitude than the first and second cycle in the pulse, making the distinction between signals identifiable. See Figure 1, Loran pulse sequence, and Figure 2, a single pulse with third cycle identified.

I would like to inject some personal evaluations here. Detecting the third cycle and tracking between station and differentiations between master and slave stations sounds quite intimidating. However these functions are accomplished by the onboard computer processor operation that is internal to each Loran receiver. The operator only has to connect the adapter and an IBM-type computer to interface with the receiver. The receiver and its internal circuitry takes care of all the other housekeeping and reports back to the operator its wellness or status value. This status value is printed in program step #75, which is included in the August 1994 "Above and Beyond" column.

This step prints position data and the "ST" or status information from the receiver. I discused this as a certainty factor, when in actuality it is called "ST," or status value, which is a hex number. The first number combined with the second number provides a status when compared to the chart shown in Table 1. Possible messages are: "88," meaning estimated position, advise possible ambiguous position; or "11," meaning verified position, data valid.

Suggestions for an Antenna

I had hoped to complete construction of a active antenna or test a loop type antenna for use with the receiver we have available. Lots of ideas have surfaced but I haven't had time to put them to the test. Kirk Bailey in Corvalis, Oregon, offered a suggestion on a loop antenna. He has constructed a copper-shielded loop that uses 40 loop turns. His approach for construction is a novel one in that a 40-conductor ribbon cable is inserted through the copper tube sections. At the bottom center copper "T," both ends are brought out and connected to standard IDC connectors. The male and female connectors are connected together one row of pins offset from each other. This effectively ties almost all pins in series, making the greatest 40-conductor cable to be inserted into a copper loop.

The loop is about 1 meter in diameter and, as in all loops, the top of the copper tube is open at the top, with a gap of about 1" being sufficient. If this were closed it would represent a shorted turn and the antenna would not function at all. Trying to wind a similar loop in other terms can be quite difficult—after a number of turns are made they seem to bulk up and it becomes very hard to wind more turns inside the copper tube. Other methods are quite possible, including placing a section of 40- to 50-lead cable and soldering together all the ends, keeping track of the start and finish and not having any shorted turns which would be defeating, to say the least. The IDC connector method is a little bulky but fast and sure-fire and puts to use inexpensive cables that might be junked. See Figure 3 for the IDC loop antenna construction method.

Don't forget that the horizontal loop is directional and not useful for navigation. However, it can be useful for tracking a single station for frequency calibration purposes. Another antenna type being tested is a common loopstick placed in a vertical position, thus making the ferrite loopstick "omnidirectional." A similar horizontal loopstick would exhibit directional capabilities. Most AM-FM portable radios use this type of antenna (horizontal), and show directional response. The loop antenna is similar in operation to a loopstick or ferrite rod antenna except that when the loop is horizontal it becomes omnidirectional.

I plan to construct a loop and a ferrite antenna for both my 60 kHz WWVB and 100 kHz Loran receivers. Test evaluation will be reported as progress is made. My TRACOR model 599J VLF receiver is what I use to receive WWVB transmissions on 60 kHz. The TRACOR 599J receiver can tune to 99.9 kHz, but it is prevented by design from receiving any transmissions on 100 kHz so it isn't compatible with pulse transmissions (Loran). Both the TRACOR and the Loran receiver boards are being used in conjunction with each other to verify how accurate my frequency standard is. Normal comparisons with the TRACOR receiver show accuracies to millihertz at 5 MHz. If I take a little more calibration time and fuss, the system is capable of much better accuracy.

The standard oscillator that I use for my master reference is Frequency Electronics Inc.'s Model FE-10A 5 MHz master standard. The FE-10 was acquired in surplus as "DEFECTIVE, OFF FREQUENCY," according to the repair depot's tag. Kerry N6IZW and I each obtained identical units, "defective standards," and recalibrated them in short order. We had hoped that they were repairable and took a gamble. The units seemed to function but were picked up in "as is" condition in surplus. In this case all worked out well but it took time to perform calibration due to settling in, (baking in) of the oscillators and their multiple ovens. I better stop here as this is getting into next month's topic: frequency counters and standards. I can't give away all the secrets for next month's column now, but it will cover several frequency counters and the main internal crystal oscillator standards that are used as the counters' reference.

Well, that's it from here on Loran and some antenna ideas yet to be tried. I am gathering materials to build the loop as I write this column and will report back on my progress. If you have any favorite circuits on antenna components for VLF applications drop me a line and I'll try to include them in a future column to share with our readers. For that matter, any items of interest will be included, space permitting, as this is your column and it's here to share ideas and promote interest in our VHF, UHF and microwave frequencies. VLF might be a little out of our operating frequency realm, except for calibration of test equipment. In this application its a must as far as I am concerned to know your frequency accurately.

Table 1. Status Values

First Digit	Second Digit
8 = estimated position initialization	8 = advise, possible ambiguous posn.
4 = coarse calculated acquisition position	4 = self-test comp., revert to zero
2 = calculated position (all station position)	2 = hardware /software error
1 = verified position	1 = data valid

Mailbox

Robert Krieger KAØQHV writes that he picked up from military surplus four transmitters, Model TCM-502BT, manufactured by Terra Comm/Loral, a San Diego Company; and two C-band omnidirectional antennas, PN #5064, from Microwave Specialty Co., also a San Diego Company. Robert states that he enjoys the column and the projects covered. The information is easy to understand and informative. He hopes that I can shed some light on these mystery boxes he has picked up. The transmitters are marked 4.5 to 5 GHz, but have no power specs or manuals of any sort. Robert would appreciate any information or opinions I may have concerning this equipment, especially conversion to ham band use. Contact Robert at 104 East 61st St., Davenport IA 52806.

While I am not familiar with the transmitters or antennas, some basic product information about what Terra Comm/Loral made might be helpful. They manufacture several microwave transmitters and receivers, mostly for video transmission. I work for Pacific Telephone and we utilize several of their portable systems for certain special events. Power output from these transmitters was less than 1 watt, most running near 100 mW. Without further information specifically covering your devices, a picture or a sketch showing some of the units' details could possibly shed some further light on these units. I don't have much to go on but can offer some speculation on how to reverse-engineer the units.

What I suggest is that, seeing you have four transmitters, pick one candidate to open up and do some probing and non-destructive exploration. A good deal of information can be obtained from the from panel markings giving directions for circuit operation. Your letter hinted that this might be a simulator or beacon of some sort. Well, if this is the case, there should be a lack of input circuitry for adjustment and monitoring of either video or modu-

lation of some sort. The local oscillator might give a further clue. Is it fixed frequency or something more elaborate? One version of this company's local oscillator utilized a synthesizer that was capable of moving about 500 to 1000 MHz of coverage. The step or frequency jumps were large—something near 30 to 50 MHz per step, or channels as they called it.

Without getting confused in the unit's exact schematic circuitry, make a first-shot evaluation at a block diagram. Try to identify the local oscillator chain and make a rough guess at its frequency. Next, give a shot at the mixing scheme. If it has video transmission it has to handle baseband video or an IF type of signal, and that is usually at 70 MHz in most systems that use RF rather than video directly. Then I would give the transmit RF chain a shot. The thing here is to look for heat-sink devices. One possible trick here is that some of these systems that I have run across do not have power devices feeding the antenna. By that I mean a VHF power amplifier we couple out of the output stage directly to a coupling circuit to the antenna. In some of these early microwave transmitters, especially those with higher power outputs, there were not many devices that would work at 5 GHz eight or 10 years ago in those designs. What they did was develop power at a lower frequency, say half or one-third frequency, and use a diode (varactor) multiplier for the final output stage.

These are no more than an educated guess, but I hope they can give you a starting point to determine what you have. It is certainly interesting and, had I been given the opportunity to pick up the material, I would have done so, as long as I didn't have to mortgage the farm.

Jim Kocsis WA9PYH picked up (at Dayton) a Micro Electronics Technology CL-2011 (Mfg. 1986) INMARSAT, whose approximate frequency of operation is 1600 MHz. Jim wants to use this for GOES reception at 1691 MHz. He tried the manufacturer, but they have no records. The unit has an external local oscillator in a block of aluminum, with four tuning stubs and three coupling adjustments tied to a broadband IF amplifier. Jim is currently building an antenna using a coffee-can feed and a five-foot dish for his 1691 system for GOES weather reception. If you have any information on this unit for Jim, contact him at 2217 Hidden Oaks Ct., South Bend IN 46628.

That's it for this month. I hope my treks through surplusland are interesting to you. Sometimes I find items in quantity sufficient to supply those interested in them before they become extinct. I try to pick up these items so they don't disappear before we amateurs can fully implement them. I have received many letters thanking me for making these items available to others. I hope that I will be able to continue to locate interesting amateur VHF UHF microwave home-brew items directly or indirectly. If the items are out there I want to tell you about them, wherever they might be, to help you hold the cost down in project construction. The main goal I have always had is amateur construction and enlightenment about the operation of circuits. As always, I will be glad to answer questions pertaining to this months topic and other microwave related subjects. Please send an SASE for a prompt response. 73 Chuck WB6IGP.

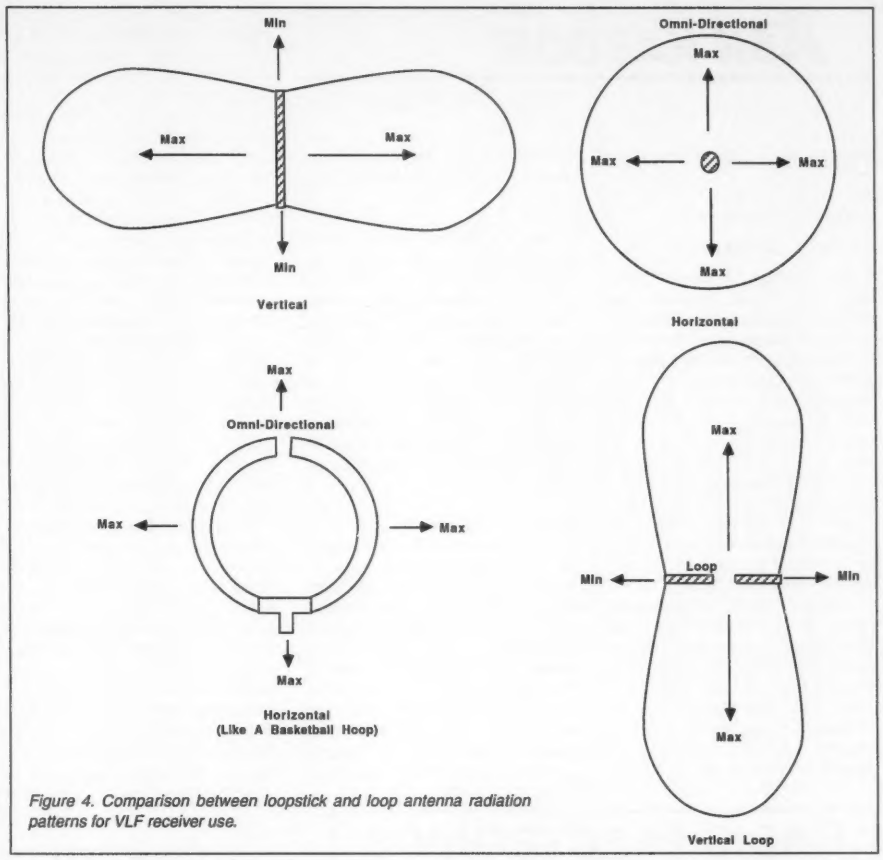

Figure 4. Comparison between loopstick and loop antenna radiation patterns for VLF receiver use.

Number 21 on your Feedback card

ASK KABOOM

Your Tech Answer Man

Michael J. Geier KB1UM
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

The Ham At Play

We hams love to build things! At least, many of us do. I don't care how much DX you chase, there's just nothing like the thrill of making an electronic gadget of some kind and seeing it work. (Then again, there's nothing like the frustration of seeing it *not* work!) When we ponder building, we usually think in terms of a project from a magazine or a book. Or, perhaps, even a kit; kitbuilding seems to be making something of a comeback, as evidenced by the growing number of kit providers. Heathkit may be gone, but their spirit lives on in newer kit companies like Ramsey and Radiokit.

There's another kind of home-brewing, though, and this month we're going to explore it. I like to think of it as a kind of play. In this type of building, when you begin, you don't know exactly with what you're going to end up! It's less like science and more like art. Yup, you start with no schematic, no plans, no instructions, nothing. You just decide what you want to make and start making it! Can you really do that?

Have At It

Yes, you can. Honest. So, how do you start from scratch and come out with something useful? The first thing you need to decide is what it is you want to make. That's the easy part. The harder part is selecting a viable approach. There are lots of ways to make any given circuit. Depending on what it is you want it to do, there could be dozens of approaches which might work. But, before you even get that far, it pays to take a look at what you have handy.

Le Boxe de Junque

When you start from ground zero, you really can't go ordering parts, because you have no idea what you need! So, take a look at your junk box, parts bins, old, scrappable boards and such, and try to formulate a circuit concept that fits into at least some of what you have. If you want to make a power-MOSFET RF amp, it would pay to have some MOSFETs hanging around. On the other hand, if you only need a half-watt output, perhaps those 2N2222As might do some good, and it might be worth rethinking the design to accommodate them, especially if the nearest MOSFET is an 800-number and two weeks away.

If you're primarily an RF builder, you probably ought to have some toroid cores and small, enameled wire for making those interstage transformers, filters and such. If you're into receivers, dual-gate MOSFETs and mixer diodes will be right up your alley. Of course, if VHF, UHF and above are your thing, you need the specialized kinds of parts those frequency ranges demand, such as surface-mount "chip" caps and monolithic microwave amplifier ICs. For the kinds of things I like to build, a good stock of 4000-series CMOS chips is essential. Some small transistors, an FET or two, and a nice selection of resistors and capacitors round out the goulash. Sure, I don't always have what I want, but at least I can get started most of the time.

Once you have some parts at arm's reach, you need something to put them on. For audio and low-frequency RF gadgets, those "protoboard" breadboarding systems are absolutely great. They have rows of holes into which you can push component leads, so you don't have to solder anything. Believe me, when you're designing from scratch, the last thing you want to do is solder, because you'll be changing your circuit arrangement around many times. Unfortunately, protoboards also have a great deal of capacitance and, therefore, capacitive coupling between the rows of holes. Up to a megahertz or two you can live with it, but beyond that it starts to get really noticeable.

Grunge

Along with all that coupling comes noise. As I mentioned, I often work with CMOS logic. Even though CMOS is inherently very low in power consumption, the switching transients do tend to show up on other signals when I use a protoboard. In a complicated circuit, it can lead to pulse jitter and all kinds of weird circuit interactions. So, is there an alternative?

There are several, but none is as easy to use as the protoboard. You can buy special PC boards which have rows of copper squares, all isolated from each other. You solder the parts to the squares and then solder wires from one to the other. But, as I mentioned, soldering is a real pain with this kind of work, so I try to avoid using this system. Still, I have had success with it in situations where the grunge level on a protoboard was just too high. You also can use good old perfboard. This stuff just has holes, no copper. You stick the parts' leads in the holes and solder from one lead to the other. I *hate* designing this way because making changes is very awkward. But, it's great for building prototypes of things you've already perfect-

ed on the protoboard. It's slow, but you can make reliable, small assemblies with this technique, and they're pretty indestructible.

And, let's not forget "dead-bug" construction, so named because of the resemblance of the upside-down parts to deceased insects with their legs in the air. Again, this involves solder, but it lets you make things that will operate at fairly high frenquencies without trouble, as long as you keep the leads short. And, if you don't wrap the leads around each other, it's not hard to heat 'em up and pull 'em apart to make changes. When developing RF circuits, I've used the dead-bug style for the higher-frequency stages, and laid the whole mess next to my protoboard so I could use it for the lower-frequency stuff. Naturally, there's no ground plane with this style of construction, and sometimes that can be a problem.

Another prototyping technique that's often overlooked is wire-wrapping. To wire-wrap, you attach parts to posts placed like pegs on a board. Then, you use a wire-wrapping gun in conjunction with some very fine, insulated wire and simply connect the dots; the gun makes a very tight wrap around the square pegs, automatically cutting through the insulation to make a good connection. This system has been very popular for digital circuitry because logic circuits often have a tremendous number of connections, and it's easy and fast to whip them together with the gun. Unfortunately, you wind up with a real rat's nest under the board, and tracing out a mistake or making a change can be extremely frustrating and difficult. For that reason, I hate wire-wrapping and avoid it for development work.

No matter what style of construction you use to test your circuit concepts, it's a good idea to use busses for your power and ground leads. It really cuts down on the noise problem. Also, don't forget some bypass capacitors. A big electrolytic in parallel with a few ceramics, placed right where the power enters the board, really can help. Also, if you still have noise problems, bypass the power going to each stage or IC with more capacitors. For logic circuits, a 0.1 µF bypass can do wonders in reducing switching transients' induction into the DC supply.

Where To Start?

It's crucial that you have test equipment and tools which are up to the job you're attempting. I've wasted many, many an hour trying to diddle some timing circuit or tuned stage into working, all to no avail because I didn't have the right meter or whatever. The most important tool you can have is an oscilloscope. Even though 'scopes don't give you the accuracy and precision of, say, a frequency counter or digital voltmeter, they can let you see things you just can't see any other way. Often, when DVM measurements look good but the thing just won't work, a glance at the 'scope instantly makes the problem clear. A good voltmeter is a must, though. Now and then the old, analog style of meter will do more for you than a DVM. Most of the time, however, the digital meter is far more useful. I still have an analog meter, but I rarely use it anymore. If you often make radio gear, a frequency counter is great. For tuned circuits, a dip meter is very useful, and I don't know why they've gone out of fashion; they tell you where any tuned circuit is resonating.

Good, clean DC power is something you just can't do without. From the type of project, you should have a sense of how much current you'll need. For all but power amplifiers, a couple of amps at 12 volts should be fine. Heck, for little CMOS gadgets, often 100 mA is more than you need. A regulated, variable power supply is great. But, if you don't have one, consider using a three-terminal regulator right on your project's board. They're cheap and simple, and they do a great job, often allowing you to use a surplus AC adapter for cheap DC.

OK, you've selected a construction method, and you have good tools and some parts. What now? Well, obviously you must know something about the basic configuration of the circuit you want to build. If it's a receiver, is it a superhet? A direct-conversion? A TRF? Or, if it's a logic-based gadget of some kind, what are its inputs and outputs supposed to do?

I find that level conversion and timing circuits are the ones which give the most trouble, so I usually do them first. For instance, if you're making a receiver that has an oscillator, or a transmitter, I suggest getting the oscillator to work first. Then, deal with the front end, driver amp or whatever's left. Once you know you have the required signals ready to go, it should be a simple matter to hook it all up with a mixer and an amplifier, or whatever else is required. I know, famous last words. It never works out that way, does it?

If it's a logic circuit, you probably have an input of some kind which must be conditioned before its levels will match the logic device's. With standard CMOS, the level isn't as critical as it is with LSTTL and other voltage-sensitive logic families. But, you may still need an amplifier stage or two, or perhaps some clipping diodes, to get things to match up. I find that logic gadgets usually must be designed from input to output, because each stage influences the next in ways I just can't simulate; I need the previous stage to work out the next one.

Next time, we'll take a look at some actual decisions you might make regarding choice of components and circuit configurations. Until then, keep playing, and 73 de KB1UM.

Arnie Johnson N1BAC
43 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

As I am working on this column, the World Cup Soccer matches are being televised. I'm trying to figure out which is more distracting, the TV or the information provided by your Hambassadors. But, somehow, I will survive and finish this column.

Also this month, the first of the last two installments from David Cowhig, 73 Hambassador to Okinawa. We will certainly miss his personal observations from the beautiful island of Okinawa, but after a trip back to the U.S. for consultations in Washington, D.C., and some home leave, he will move to Taiwan and will continue his submissions from there. Have a great break, David, you deserve it! Note David's new address!

Also with David in mind, I was surprised to see one gentleman's name mentioned twice as I was working on the column, in two different contexts. Masayoshi Ebisawa JA1DM, IARU Liaison Officer and Director-General of JARL, sent a FAX concerning new frequencies in Japan, and then David Cowhig mentioned that he met Masa when David visited JARL Headquarters. Masa gave David one of his cards which is very special. It is one of Hokusai's 36 views of Mt. Fuji. It is being printed in the column for your enjoyment.

Next month, completion of David's and Rick Nui's articles, more information from Bill Meara in the Dominican Republic, Lorbie Gaston in the Philippines, and other info from around the world.

It's now time to get on with the great news provided by some of your Hambassadors. Without further ado, 73, Arnie N1BAC.

Roundup

Japan *FAX from The Japan Amateur Radio League, Inc. (JARL):* I am most pleased to announce that on May 20, 1994, the Japanese Ministry of Posts and Telecommunications has officially given permission for use of the following frequency: 3,747-3,754 kHz. It is to be noted therefore that the following segments can now be used within the 3.5 MHz band, by Japanese radio amateurs: 3,500-3,575 kHz, 3,747-3,754 kHz, and 3,791-3,805 kHz.

We ask all amateurs the world over, from now on, to please watch for JA's new band: 3,747-3,754 kHz. Masa Ebisawa JA1DM, IARU Liaison Officer. *[JARL, PO Box 377, Tokyo Central Post Office, 100-91, Japan; Tel: +81-3-5385-3106; FAX: +81-3-3943-8282.]*

Malaysia *Downloaded from packet, from 9M2SS via VK2AGE:*

LATEST UPDATE SEANET 94
22ND SEANET CONVENTION 11-13 NOVEMBER, 1994
VENUE: D'VILLAGE RESORT, MALACCA (MALAYSIA)
WELCOME TO SEANET '94 IN HISTORIC MALACCA (ALSO SPELT MELAKA). IT IS OUR PLEASURE TO INVITE AND WELCOME YOU TO SEANET '94 AS WELL AS TO FASCINATING MALAYSIA. WE HOPE YOUR PARTICIPATION IN SEANET '94 AND YOUR VISIT TO MALAYSIA DURING VISIT MALAYSIA YEAR 1994 WILL BE MOST MEMORABLE AND CHERISHED HIGHLIGHT OF THE YEAR FOR YOU.
CONVENTION REGISTRATION FEE FOR SEANET '94 IS RM160 PER PERSON. AND INCLUDES CITY TOUR AND MOST MEALS, EXCLUDING TRANSFER FROM AIRPORT/HOTEL/AIRPORT.
ACOMMODATION REGISTRATION:
OFFICIAL HOTEL: D' VILLAGE RESORT, AYER KEROH, 75450 MALACCA. ACCOMODATION: MOTEL CHALET RM100 STANDARD CHALET RM130 SUITE CHALET RM160 SINGLE/DOUBLE. ALL ROOMS ARE AIR CONDITIONED. RATES QUOTED ARE IN MALAYSIAN RINGGIT (RM) AND IS ON A PER NIGHT BASIS INCLUSIVE OF SERVICE CHARGE, GOVERNMENT TAX AND TWO BREAKFASTS. ALL PAYMENTS IN MALAYSIAN RINGGIT (RM) N.B. EXCHANGE RATE IN MAY '94 IS APPROXIMATELY US1 = RM 2.71.
MODE OF PAYMENT: MONEY ORDER/BANK DRAFT/BANKER'S DRAFT IN THE NAME OF "MARTS-SEANET"
CONVENTION PROGRAMME:
FRIDAY, NOV 11
SEANET '94 REGISTRATION 10AM-5 PM.
OFFICIAL LAUNCH BY THE RIGHT HONORABLE CHIEF MINISTER OF MALACCA WITH A GRAND WELCOME DINNER SPONSORED BY THE MALACCA STATE GOVERNMENT. PARTICIPANTS WILL ALSO BE TREATED TO A CULTURAL SHOW.
SATURDAY, NOV 12
THE PROGRAMME WILL INCLUDE A CONDUCTED TOUR OF HISTORIC MALACCA, SHOPPING TRIPS FOR SPOUSES/CHILDREN OF PARTICIPANTS AND TECHNICAL SESSION FOR SEANET '94 PARTICIPANTS. A BANQUET IS SLATED FOR THE NIGHT WITH SING-ALONG AND LUCKY DRAW SESSION.
SUNDAY, NOV 13
A PLENARY SESSION HOSTED BY MARTS WILL BE HELD IN THE MORNING. THE VENUE FOR SEANET '95 WILL BE DECIDED AT THIS SESSION. THERE WILL BE A FAREWELL LUNCH BEFORE HOST BIDS 'SELAMAT JALAN' (FAREWELL) TO ALL PARTICIPANTS. DURING THE CONVENTION MARTS WILL OPERATE STATION WITH A CALLSIGN 9MØSEA.
ARRIVING MALACCA: THERE ARE NO SCHEDULED COMMERCIAL FLIGHTS INTO

THE CITY OF MALACCA. ARRIVALS INTO MALACCA VIA THE MALAYSIAN CAPITAL CITY OF KUALA LUMPUR (KL) IN THE NORTH AND SINGAPORE IN THE SOUTH ARE BY THE EXCELLENT AND SCENIC NORTH-SOUTH PLUS EXPRESSWAY. ROAD TRAVEL TIME FROM KL IS ABOUT 2 HOURS (200 KM) AND FROM SINGAPORE 4 HOURS (400 KM). A SUITABLE TRANSFER FROM KL AIRPORT/HOTEL WILL BE ARRANGED PROVIDED ADVANCED INFORMATION IS SUPPLIED. GROUP TRAVEL IS ENCOURAGED. COST OF TRANSFER IS ON PARTICIPANT'S ACCOUNT.

MALAYSIAN AIRLINE IS THE OFFICIAL CARRIER. SPECIAL FARES AVAILABLE FOR REGISTERED PARTICIPANTS BEFORE SEPTEMBER 15. ALL CORRESPONDENCE TO: SANGAT SINGH, 9M2SS, ORGANISING SECRETARY, SEANET '94 SECRETARIAT, 111 JLN. TERASEK LAPAN, BANGSAR BARU, 59100 KUALA LUMPUR (MALAYSIA). CONTACT NUMBERS: TELEPHONE: (603) 256 1571; FACSIMILE: (603) 253 7373.

YOU MAY ALSO CHECK INTO SEANET 14.320 MHZ +/- QRM AT 1200 UTC AND INQUIRE FROM THE NET CONTROLLER.

Switzerland *Press release from International Telecommunication Union (ITU):* Study Group 14 of the ITU decided to adopt a new standard for future high-speed modems. This adoption will give a go-ahead signal to the industry to offer new products using high performance data transfer technology. The new standard will be called V.34 and will surpass the current technology used in data transfer via traditional telephone lines.

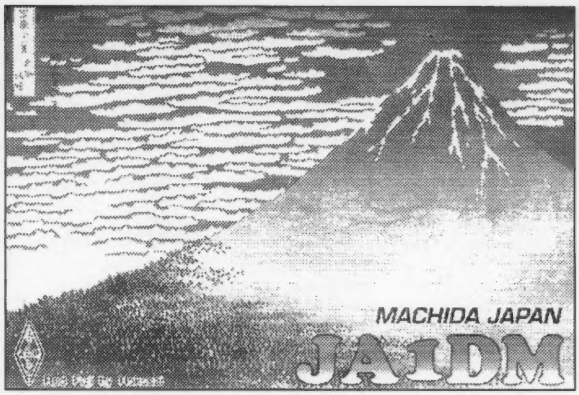

Photo A. QSL card of Masayoshi Ebisawa JA1DM, Director-General of the JARL.

V.34 future modems will transfer data at speeds twice the current technology, thus the nickname *V.fast.* These new modems will have variable data transmission capacity ranging from 2,400 bit/second all the way up to 28,800 bits/second. The new modems will use a feature called "line probing" that will allow modems to identify the capacities and quality of the phone line and adjust themselves to allow, for each individual connection, for maximum throughput using the highest possible data transmission rate. In addition, the standard will support a half-duplex mode of operation for fax applications and will support automoding to existing V-series modems.

V.34 will not only foster worldwide connectivity due to its adaptive capacities, but will enlarge the market opportunities in areas which face poor telephone line quality.

At the same meeting, a standard—Recommendation V.18—was also approved, which will provide, for the first time, recognition of the communication needs of the deaf and hard-of-hearing. This Recommendation, with its capability to interwork with all existing devices, provides the platform on which a universal standard communication device can be built.

The following is from the ITU Newsletter: TELECOM is the "Olympics of telecommunications," held every four years by the ITU, an is the largest event of this type in the world.

TELECOM 95 will take place in Geneva from 3-11 October 1995 and will comprise an Exhibition and Book Fair, Strategies Summit, and Technology Summit.

The theme of the Technology Summit is "Convergence of technologies, services and applications." Papers are invited to focus on applying technology and creating applications in this cross-sectorial environment. *[ITU, Place des Nations, CH-1211 Geneve 20, Switzerland.]*

Taiwan *FAX from Chinese Taipei Amateur Radio League (CTARL):* We are very pleased to announce that on July 1, 1994, the Chinese Taipei Ministry of Posts and Telecommunications has officially given permission for the use of the following frequencies: 3,500.0-3,512.5 kHz & 3,550.0-3,562.5 kHz; 18.0680-18.0805 MHz & 18.1100-18.1225 MHz; 24.8900-24.9025 MHz & 24.9300-24.9425 MHz; 50.0000-50.0125 MHz & 50.1100-50.1225 MHz.

All amateur radio stations over the

world, from now on, please watch for these BVs new bands. Thanks for your attention. Best 73 de Bolon Lin, BV5AF, President of CTARL. *[CTARL HQ, PO Box 39, Changhua 500, Taiwan; Tel: +(886)-4-7388746; FAX: +(886)-4-7385441.]*

PEOPLE'S REPUBLIC OF CHINA

Rick Nui BZ1QL
Room 316 Building 25
Tsinghua University
Beijing 100084
People's Republic of China
Packet: BY1QH @ JA5TX.JPN.AS

Ham radio on Beijing TV: A 25-minute English language television program about amateur radio and the Tsinghua University Amateur Radio Club (TUARC) was aired on Beijing Television (BTV) February 20. This may have been the very first time in China that our hobby was introduced to the general public via a noted TV station. Four of the club members—Nick, Gray, John, and Sean—did a super job in the show while Rick was behind the scene as an assistant director. Thanks to Sam N3NFK for a videotape of reference.

BT2000BJ QSLs: At last, all the stacked BT2000BJ QSL cards were sent out in the first week in April from TUARC. Again, we deeply apologize for such an "unbearable" delay. By the way, the BY1QH *Callbook* QSL route still works perfect: PO Box 2654, Beijing, China.

Wanna have a "BY" license? Requested by quite some amateurs interested in obtaining a BY license during their stay in China, we've gotten the following paragraph abridged from *China Ham News* 15 Jan 1994. Hope it gets more propagated and makes some sense.

"The People's Republic of China Sports Commission issued an important formal file regarding Amateur Radio in China on December 29, 1993, establishing a brand-new set of regulations for foreign amateurs who would like to obtain tentative licenses to operate from BY . . . According to the Government document, 1) Prior to the establishment of Amateur Radio reciprocal agreements between China and other countries, a foreign amateur, if he wishes to operate from a BY station, should send to the Chinese Radio Sports Association (CRSA) a formal letter of application where a copy of both his home country license and his passport is enclosed, along with clear description about why and when he visits China, and on what modes, from which QTH and from which station he wants to operate. This application should be directed to CRSA, PO Box 6106, Beijing, three months prior to the trip, and is charged five US dollars or 20 IRCs for return postage and other relevant costs. A foreign ham is then permitted to operate from the place(s) or station(s) specified by the tentative license confirmed, signed and sent by CRSA. The callsign pattern is: (your home call)/(the BY station call). e.g. DJ7BU/BY1QH. This regulation also applies to those from Hong Kong, Macao and Taiwan."

Right now a home station, under whatever circumstances, is still *not* permitted for a foreign amateur in China. With a close connection with CRSA, TUARC offers to help you handle all the license affairs at no additional charge provided you send all the required items to the airmail address (Attn: Rick Nui) at the beginning of this article.

Ham made it! Congratulations to Rick BZ1QL on being elected among over 10,000 students as one of the "Top Ten Student Elites of Tsinghua University" because of his hard work and many achievements in the amateur radio area. Mr. Wu Shaozu, General Secretary of China's National Sports Commission as well as a wholehearted supporter for ham radio development, was present in the awarding ceremony.

OKINAWA

David Cowhig WA1LBP
AIT TAIPEI
Department of State
Washington D.C.

The JARL Museum and the offices of *CQ Ham Radio* and *Ham Journal* were the highlights of my June trip to Tokyo. Mamoru Fujimuro JA1FC manages the fine ham history collection at the JARL Museum (Tel: (03) 5395-3121) located just 100 meters from Sugamo train station. The JARL museum has a wonderful collection of early ham radio equipment. After ham radio opened up in Japan in 1950 near the end of the U.S. occupation, the equipment of the typical Japanese ham evolved from home-brew to Hallicrafters equipment produced in Japan under license and then to Trio and other Japanese brands by the late 1950s. Many Japanese hams still dream of owning Collins equipment which still enjoys a reputation for very high quality in Japan. Fujimoru-san told me that atop the grave of Uda, inventor of the Yagi-Uda directional antenna, somewhere in the Tokyo region, sits a Yagi-Uda antenna! Uda was the inventor, Yagi was his famous professor who helped promote the new type of directional antenna in the scientific world.

The JARL International Section would like to help hams from any country get a Japanese ham license for their stay in Japan. Write to the JARL International section, 14-2 Sugamo, 1-chrome, Toshima-ku, Tokyo 170, Japan. FAX: 81-3-3943-8282. International Section manager, Jay Oka, who holds both JA1TRC and KH2J invites you to use his E-mail address: rdg02524@niftyserve.or.jp .

Japanese ham magazine giants Masao Hamada JH1ISF (*Ham Journal*), Shigeki Hosono 7L1FPO (*CQ Ham Radio*), and amateur cartoonist-but-professional-ham editor Shinichi Ogushi "Oxy" JH6QDK, and COMPUSERVE 101113,1763 (*Transistor Technology*) taught me about the Japanese ham world over sushi and beer. *CQ Ham Radio* is a telephone-book size monthly ham magazine, *Ham Journal* aims at hams who want to master the latest communications technologies, and *Transistor Technology* chooses each month an area to explore in depth such as analog technology, computer interfacing, Z-80 microprocessor applications, and current trends in electronics. (All these Japanese language magazines are available overseas through Japan IPS, Iidabashi 3-11-6, Chyoda-ku, Tokyo 102, Japan).

Several hours wandering through the Tokyo electronics district of Akihabara revealed that IBM-PC standard computers running Japanese language DOS are becoming very popular in Japan. Hardware prices are falling fast and so are hobby computing and home multimedia computer systems, heretofore much less popular in Japan that in the United States, is growing very rapidly. Japanese PC-DOS loads fonts for the kana syllabary and about 5000 kanji into memory to make possible Japanese language text processing. *[Article continued next month.—Arnie]*

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NEVER SAY DIE

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conference in New Orleans in 1989 Sherry and I were returning late one night from a riverboat jazz concert and happened to pass a grungy little bar. The door was open and out tinkled some Scott Joplin music. I stopped Sherry and said we had to go in and listen. A couple of Cokes and hours later I was talking with Scott Kirby about recording him. Scott was playing Joplin the way I had been hearing it in my mind. He was a 24-year-old graduate of OSU and was making his living playing ragtime on the New Orleans streets with an upright piano on wheels.

So Kirby came to New Hampshire a few weeks later. Sherry located a Steinway grand in a Peterborough church. Luckily I had a recording engineer on my staff, so we set up in the church and recorded my first Greener Pastures Records CD. This was GPR-001, and it's sold very well. Very well for an independently produced CD. The six major record companies had, at that time, 96% of all music sales, with the other 4% shared by around 15,000 independents. That's a lot of slices from a pretty small pie. Most record stores won't bother dealing with the indies, as they're called. Too much trouble. And radio stations play major label stuff almost exclusively, so the public doesn't even know about indie music.

Someone ought to do something about that.

Then, the next year I was asked to give a keynote talk at an indie music conference in New Orleans. The more I talked with the indies the more I felt I might be able to help. I started by setting up a credit bureau to help the indies find out which of the hundreds of music distributors were paying and which were screwing their customers. I did find a few that actually were paying. But the music business is about as crooked as they come. Indies essentially have to sell everything on consignment and trust. Distributors then try, though not very hard, to get the music into record stores. The stores are supposed to pay after they sell the music, but in practice most of 'em only pay when they have to re-order. The distributor holds onto most of this money, just in case he gets returns later and the record company has disappeared by then, which many do.

The next thing I knew I was setting up a distribution company (Creative Music Marketing) and a mail order division which specialized in indie music. By then I'd recorded a couple more CDs of Scott playing Joplin's music, and graduated from the church, where we had to record after midnight to avoid truck noises from the street, to a makeshift studio in my garage at the farm. Well, it was fairly quiet there, except for the ducks and geese commenting on Scott's playing.

We'd located a couple fabulous old pianos for Scott which Knud Keller KV4GG, an old friend, had refurbished. The garage was pretty good, but not perfect. I eyed the back end of our old barn across the road. There's room for a studio there. So one of my employees who was into carpentering got together with his brother and $75,000 later we had one of the nicest studios in the country. I hope you can see it some time, it's a beauty.

I'd discovered a Vermont bluegrass band which I liked, so we recorded them. And they'd been visiting Russia and met a Russian bluegrass group in Moscow. The tape was great, so when they decided to come to America for a tour I got them to come to my studio, where we recorded Kukuruza. They play Russian folk music in the American bluegrass style.

As we started making more CDs we discovered the obvious: The more you make, the lower the price. So we started making CDs for other indies to build up our volume. Before long we were cranking out 100,000 and more CDs a month, and had made them for over a thousand indies. That's how things like this get out of hand.

Since we had the mastering facilities and the publishing ability to turn out the liner notes, we were all set to do CDs for the indies at great prices. Plus we had the ability to provide them with a free ad in *CD Review*, thus helping make a couple hundred thousand music buyers aware of it, plus a free ad in *Music Retailing*, a publication of mine which reached every known record store in the country.

I don't know how much all this helped, but indie sales for some reason went in three years from 4% of the market to 12%, a gain of about $800 million in sales.

Cold Fusion

A couple years ago the governor called and asked if I'd be a member of an Economic Development Commission and try to help the state recover from the recession. Indeed, I found that New Hampshire had been hit the worst of all states, with our unemployment rate going from around 2% to over 7%, with banks closing by the dozens, property prices crashing, and so on. It was a mess.

As a member of the Commission I found that the meetings with 30 people were useless. Nothing could get done or even discussed, so I started writing reports on what I'd discovered as a result of subcommittee meetings and reading the recommended books. I found out what had gone wrong with New Hampshire and offered some inexpensive, practical proposals for getting out of the mess. I looked into our school system, taxes, crime, drugs, and so on. I found that we'd be able to cut our school costs in about half, yet enormously improve the education our kids were getting. I discovered a way we could get our state bureaucracies to happily cut themselves in half within three years. I thought up a way to cut the costs of our prisons by 90%, while providing unlimited prison space and actually re-educate and motivate the prisoners. Things like that.

No one cared.

I put the first year of my reports out in a book which I've been hawking: *We The People Declare War On Our Lousy Government*. It was $16 with shipping. I still have a few left, so you can have a copy of this 360-pager for $10 postpaid, while they last. You'll enjoy it.

As I looked into health care I found there were a whole bunch of ways our medical establishment was screwing up. Our health system is being driven by the federal government, and that is both increasing our costs enormously, and keeping us from benefitting from new developments. I could see where we could expect to be almost illness-free within a few years if only the medical establishment, controlled by the pharmaceutical industry, would allow the needed research. They were busy discovering chemicals to fight the results of illness, and refusing to let anyone go after the causes.

In 1989 I read about Pons and Fleischmann announcing they'd discovered a new source of energy. Cold fusion. Then came a deluge of ridicule and cold fusion disappeared. Oh, I read in the Rensselaer Polytechnic Institute newspaper that a team of students had checked it out and had generated excess heat, just as claimed by Pons and Fleischmann. Then the August 1993 issue of *Popular Science* had an article saying that many labs around the world had validated the phenomenon, but that our Department of Energy (DOE) had prohibited any American labs from researching it. Apparently most of the work was now being done in Japan. Just what we needed, to lose out on what could be the biggest new industry in a hundred years.

Then I was contacted by K5CB, who was funding ENECO, a company investing in cold fusion patent applications and rights. He wondered if I might be interested in starting a magazine. What a dumb question. Having helped cellular telephones become an industry, then personal computers and compact discs, of course I was interested.

In December I attended the Fourth International Cold Fusion Conference on Maui. Yes, I cheated and went a few days early so I could visit all six major islands and go diving and hamming on them. For my birthday in September I'd visited 11 Caribbean countries and dived most of them. Hammed 'em too.

The first issue of *"Cold Fusion"* came out in April. Yes, cold fusion is real. And yes, the American scientific establishment is still fighing and ridiculing it. So what's new? I don't think you can point to any major scientific break-through that hasn't been ridiculed and resisted by the establishment. And the media. As Max Planck (quantum mechanics) said, "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it."

So today we have Pons and Fleischmann over near Nice on the French Riviera in a $25 million lab built for them by Toyota. We have the Japanese investing tens to hundreds of millions in new hydrogen energy research, as they call cold fusion. And here we have a physics professor in Vernon, Texas generating excess heat in his home lab, while our universities are wasting billions on hot fusion.

The advertising support for the new magazine has been much less than hoped for, so we'll be changing to a newsletter format until the field gets out of the laboratory and starts to become an industry. The main thing is to provide communication to help researchers progress.

From everything I've seen we will be seeing the end of the fossil fuel age very soon. No more gas stations. No more power lines going across the country. No more acid rain and pollution from our cars. I'm getting on in years, but I hope I'll live to see it happen.

I started out in the roaring '20s, lived through the great depression of the '30s. Fought in the war of the '40s. It's been quite a life.

So now *73* is entering its 35th year and I'm entering my 73rd year. I've tried to make *73* the ham magazine you like best. I watch the reader cards every month to see how much you like what, and we're guided by that. I am worried about amateur radio surviving the '90s. With the FCC starting to take our most valuable future frequencies away and auction them off, I can see the handwriting. Sure, we could easily become so valuable to our country that we wouldn't have to worry, but I see almost zero interest from anyone to make changes. We're having a great party and don't want to worry. I watch my mail. I read every club newsletter I get. I keep hoping to see some interest in preserving our future. I see nothing. Don't worry! Have fun! The party is never going to end.

I hope I'm not a bore when I nag, trying to get you to go out and *do* things. I've been trying to convince you to quit smoking, drinking, and over-eating . . . not for my good, but for yours. I've been trying to get you to think and be active . . . to read magazines and books, to go into business for yourself as an entrepreneur so money won't be as much of a problem. Most of my life I haven't had much money, but I've never cared. And when I do have it I mostly spend it putting other people into business.

I love it when I meet hams who tell me that I've had a positive influence on their lives. If everyone would make an effort to move the world ahead just a little instead of taking a free ride, we'd gradually see things getting better. I don't think we're seeing that. I look back on what I've accomplished, not so much to brag or exaggerate my influence, but to say, hey, you can do anything I've done. Just try.

The cellular telephone industry was inevitable, but I think I helped speed its arrival. Ditto the personal computer,

and the compact disc. Now I'm trying to jump-start the cold fusion industry, plus get the word out that AIDS is curable, even in its late stages.

I wish I had more time to write. I've gotten tons more things to write. I'll list some of the stuff I've got done in Uncle Wayne's Bookshelf.

Now and then a reader corners someone who's worked for me and wants to know what the real Wayne Green is like. There are no hidden agendas. What you're reading is just like talking with me, only for some reason you don't bother to talk back. Well, write. No tapes, puhleeze. Gawd, I hate getting chatty cassettes. Or phone calls. Hey, my other line is ringing, gotta go.

Solving the Code Problem

The International Telecommunications Union (ITU) requires a knowedge of Morse code for our ham licenses. Their rules don't say anything whatever about 10 words per minute or 13, or even 20. Just a knowledge. So why are we beating ourselves over the head with a lead pipe over this thing?

The fact of the matter is that even a semi-brain-dead dweeb can learn the letters, numbers and punctuation in about an hour. I learned 'em one night as a kid in about a half hour while I was getting dressed in my Boy Scout uniform for a Troop 34 meeting in Brooklyn. Once you know the characters, you can "copy" at five words per minute. All you have to do, as I've explained several times before, is write down the dots and dashes, which is simple to do at that stupid speed. Then you can decipher 'em in your own sweet time. There's no time limit on the ham exams. If a VEC tries to rush you, report him for speeding.

So, if the encrusted old-timers in our hobby . . . for instance the ones who dominate the ARRL board . . . insist on keeping the code as part of the license test, let's at least get it down to five-per for all license classes so newcomers can get it out of the way with an hour's work. From there on, if it's fun to use, we'll use it.

But do you have any leverage on the ARRL directors? You bet your sweet bippy you do. Their mantra is to join the League so you can have a voice. As with most things we hear from officialdom, the exact opposite is true. As soon as they have your money, your leverage is zilch. The only power you have with the League is when you withhold your "dues." If enough people refuse to be members I guarantee you'll see an emergency board meeting and a fast change of policy. I know of no other way you can influence these old turkeys. I know many of these guys and I'll tell you right now that most of them hold the members in contempt. It's the nonmembers that worry them. Make sense?

There isn't one major problem with amateur radio today that couldn't be solved if the directors gave a hoot about the hobby. They talk the talk, but they don't walk the walk. Meanwhile our growth is slow, our bands a mess, and the FCC is auctioning off our most valuable yet unused frequencies.

Read the Fine Print

I could hardly believe my ears! Only one person at the recent Dallas Hamfest said anything about how small the print is in my editorials. Now, just in case this has been annoying you, let me explain.

When anyone says anything about the small print the first thing I do is whip out the glasses from my shirt pocket. If you shop around a little, all it takes is five lousy bucks and you'll be able to read the fine print as easily as I do. The discount stores have reading glass specials every now and then. I really hate paying $12 for reading glasses when they sell them for $5 every so often.

Oh, it took me a while to figure out the glasses con. When I suddenly lost my eyesight, I went to an eye doc and went the usual route. Two hundred bucks for a pair of nice glasses. Holy zorch! And of course I kept dropping them every time I leaned over to pick up a penny, ever in search of that elusive good luck. And this scratched the lenses. Or I'd sit on 'em when they were on the bed. Or step on 'em when I got out of bed.

All that got expensive for a seven-generation skinflint of Scotch ancestry. Then I discovered that I could get the same glasses in Hong Kong for only $100, complete with automatic darkening lenses when I was in the sun. The glasses stores there even have a machine that checks your eyes for your prescription. I was getting over to Hong Kong every year leading a group of electronic business people to the yearly electronics shows in Tokyo or Osaka, Seoul, Taipei, and Hong Kong (we had two to three hundred going over for the two-week tour every October) so I had no problem getting bargain glasses.

Then I read somewhere that those reading glasses in discount stores are just as good, so I tried a pair. My eyes needed +2.5 to bring everything into focus. These days it's +3.0 for reading and +2.0 for the farther-away computer work. At five bucks, if I step on 'em, it's no big deal. Crunch. Actually, since they're made of plastic, it doesn't seem to hurt 'em.

Anyway, when you get older your eyes need some help, or you need longer arms.

If you're a new reader, you don't know the story of how I lost my eyesight. I lost it all at once. Before that I'd always had exceptional vision. I could read the gag business cards with one-point type. I could read signs two blocks away that were a blur to everyone else. Then it happened.

In my teens I bloated up and got fat. And I stayed fat, despite heroic dieting efforts. The old seesaw of "lose 20 pounds, gain 25." I dieted. I fasted. My weight went up and down, but more up than down. So one day I read about this great new diet where I could concentrate on eating protein. And when I felt hungry, all I'd have to do was drink diet soda pop. Hey, cool stuff! They were using saccharine to make the junk taste sweet in those days. I bought a few half-gallons of diet soda and got going on my new diet. And it worked, I didn't feel hungry after chugalugging the no-cal goop.

Then, along about the third day of the diet I noticed that it was getting difficult to read the print in pocket books. Hmm. The next day typewriter type was getting fuzzy. By the fifth day the headlines were blurring out. Time to stop all this before I go blind. When I stopped drinking the no-cal stuff my eyes stopped getting worse, but they didn't get better either. That's when I got my first pair of glasses. That was about 25 years ago and my eyes never got any better, so I've been a prisoner of reading glasses ever since.

At the time I wrote about my experience in my editorial. It was timely because a couple months later there was a big fuss about the damage that saccharine could do and it pretty much was phased out as a sweetener.

The eye doctors all explained that it was just me getting older that made me need glasses. Yeah? So how did all this happen in five days? Some day I suppose we'll find out that the saccharine makers knew about all this and kept it a secret. Meanwhile I've been a little leery of substitute chemicals. Some day we may learn that Nutri-Sweet also can produce health problems and the manufacturers knew it. Serves us right for trying to cheat Mother Nature (aka God).

Anyway, spend the lousy five bucks and get some glasses once you find your arms getting short or my editorials in too fine a print to read comfortably. It's bad enough that I fill three or four pages with my mice-type stuff, if we printed it in type-for-the-blind it'd fill eight to 10 pages and we'd have to change it to *Uncle Wayne's Trivia Magazine*.

Oh yes, I solved my fat problem by taking off 85 pounds over a seven-month period and then changing my eating habits. I haven't had to diet much since then, and that was over 20 years ago.

One more glasses hint: They're all put together with little screws which eventually start unscrewing and falling out. Most of the time you can find the tiny screw and put it back in again. I think they use screws because this forces so many people to go to a glasses store for the repair. Well, there's a way to end that frustration. The next time a screw pops out, leave it lay and replace it with a short length of paper clip wire, crimped at the ends. It isn't elegant, but it'll never fall out. You've got some diagonals and long-nosed pliers which will do the job in a minute.

Dear Occupant:

Your body is designed with remarkable restorative powers. It's enormously over-designed for survival. It's able to keep going and repairing itself fairly well despite constant high stress, an input of coffee, Danish, burgers, fries, malts, and Coca Cola. Despite a lack of exercise, tons of beer and pretzels, a lack of sleep, an ungodly intake of chemicals via food preservatives, your water supply (which brings you fluoride, chlorine, lead, etc.) and pharmaceuticals. Even highly addictive and destructive drugs such as alcohol, nicotine, cocaine, and so on. It keeps going even when deprived of the ultraviolet light it was designed to need, and in the presence of electromagnetic fields which interfere with the ability of its cells to communicate. It does its best to keep going despite steady infusions of deadly poisons such as mercury, silver, and nickel via dental fillings. Even with all these destructive things most bodies are able to keep going for 50-60 years, a demonstration of the incredible repair system which is built in.

Sure, there are some genetically influenced repair problems which result in lowered performance. But most of these can be avoided if the occupant observes known health rules.

Oh, we know we'll live longer and healthier if we eat right, avoid drugs, exercise, get enough sleep, keep our stress to a minimum, and drink eight glasses of water a day. We know it, but we keep putting all that off until tomorrow . . . the tomorrow that doesn't ever quite come.

We know now that we can have healthier, more intelligent, and better kids if we give them a good start. And that means not screwing up our sperm and ova with drugs or magnetic fields *before* conception. It means being careful during pregnancy of magnetic fields, eating right, avoiding drugs and other chemicals, and avoiding stress or physical pain to the fetus.

We know that we've really screwed up the first year of life for most children by separating the baby from the mother. We know that few of our child-care facilities are worth the powder to blow them to hell. We know that our schools are a major disaster. And we know what damage most fast food does to bodies, yet there we are, at McDonald's, queuing up at the counter, and not for their salads, either.

When we're young we think we're immortal. When we get older and, in a few rare cases, wiser, it's too late. Yes, it's difficult to know what's best to do. We have the cigarette companies telling us how wonderful their product is, and that they've seen no evidence that convinces them that smoking is harmful. We have an endless bunch of people selling baloney diets, cures, and nostrums. We know we can't trust the government on anything, so where can we turn for information or help?

Our lives are filled with religion, ball games, soap operas, and "news" programs, helping us pass the time until our lousy diet, stress, or perhaps spending too many hours too close to our linear amplifier whisk us on to whatever next world awaits. Repent! Well, at least patronize that marvelous Wendy's salad bar more often, and hold the lousy fries.

Number 23 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

SEP 2-3

NEW ORLEANS, LA The New Orleans Internat'l DX Convention will be held at Royal Sonesta Hotel on Bourbon St. Times: Fri., Sep. 2nd, 1 PM-11 PM; Sat., Sep. 3rd, 8 AM-Midnight. Registration deadline is Aug. 15th. For more info, call *(504) 283-4143 days only; FAX (504) 524-2129.* Send checks or money orders payable to: *New Orleans Internat'l DX Convention, c/o Michael Mayer W5ZPA, 5836 Marcia Ave., New Orleans LA 70124.*

SEP 4

ALAMOGORDO, NM The Alamogordo ARC, Inc. will sponsor VE Exams at 9 AM at the New Mexico State Univ. -Alamagordo, in the Pro-Tech Bldg. Electronics Lab. For further info, call *Ole WA5IPS, (505) 437-5896.*

SEP 10

CLIFTON PARK, NY "Hamfest 94" will be held at the County Fairgrounds in Ballston Spa NY, from 7 AM-3PM. Sponsored by the Saratoga County RACES Assn., Inc. Set-up Fri., Sep. 9th, 7 PM-8:30 PM. Talk-in on the WA2UMX Rptrs., 146.40/147.00 and 147.84/.24. Contact *N2FEP, P.O. Box 41, Rock City Falls NY 12863.*

ERIE, PA "Erie Hamfest `94," sponsored by the Radio Assn. of Erie, will be held 8 AM-2 PM at Franklin Twp. Fire Hall. Set-up at 5:30 AM. VE Exams at 9 AM at Franklin Center Methodist Church. Talk-in on 146.01/.61. Contact *Tom McClain N3HPR, 3954 Solar Dr., Erie PA 16506. Tel. (814) 833-1640.*

FORT WAYNE, IN "Summit City Computer Show/Hamfest" will be held by The Fort Wayne RC, from 8 AM-2 PM at Allen County 4-H Fairgrounds. Talk-in on W9TE 146.16/.76. Contact *John Goller K9UWA, 4836 Ranch Rd., Leo IN 46765. Tel. (219) 637-6426.*

TOPEKA, KS The North East Kansas ARC will hold their 5th annual event ('FEST 1994) at Knights of Columbus, Grand Hall. Hours: 9 AM-3 PM. ARRL Forum. VE Exams. Silent Key Equip. Auction. More. Talk-in on 146.355/.955 WV0S Rptr. Tables by advance registration only. Contact *Rob Nall WV0S, 5707 SW 28th Terrace, Topeka KS 66614-2420. Tel. (913) 271-8899.*

UNIONTOWN, PA The Uniontown ARC will hold their 45th annual Gabfest on the club grounds on Old Pittsburgh Rd., starting at 8 AM. Talk-in on 147.045(+) and 147.255(+). Contact *Carl or Joyce, (304) 594-3779.*

SEP 11

BOLINGBROOK, IL The Bolingbrook ARS will hold its 10th annual Hamfest/Computer Fair at the Inwood Rec. Center, 3000 W. Jefferson St. (Rt. 52), Joliet, IL. Time: 8 AM-3 PM. VE Exams 9 AM-noon. Talk-in on 147.33(+) kHz and 224.54(-) MHz. For details, call *(708) 759-7005.*

BUTLER, PA A Special Event will be held at the Butler Farm Show Grounds from 8 AM-4 PM. For details, contact *Joe Stalhman WA3BVQ, 499 Kiester Rd., Slippery Rock PA 16057. Tel. (412) 794-8383.*

DUBUQUE, IA The Great River ARC, Iowa Antique RC and Historical Soc., and two computer users groups will co-sponsor a Hamfest/Radiofest/Computer Expo at the Tri-State Blind Soc., 3333 Asbury Rd. Time: 8 AM-3 PM. Talk-in on 147.84/.24. Contact *Loren Heber N0YHZ, 9479 Lauderville Rd., Dubuque IA 52003* or *Jerry Ehlers NONLU, 3115 Brunswick St., Dubuque IA 52001. Tel. (319) 583-1016.*

GAITHERSBURGH, MD The 37th annual F.A.R. FEST '94 will be presented by The Foundation for Amateur Radio, Inc. The event will be held at the Montgomery County Agri. Center. Talk-in on 146.955(-), 443.400(+) and 146.52. VE Exams at 9 AM (by the Laurel VEC's). Computers and software. Commercial bldg. open at 8 AM. Contact *Mary Morris, (703) 971-3905*; or *Al Brown, (301) 490-3118.*

MONETT, MO The Ozarks ARS Hamfest/Picnic will be held at Monett City Pk. Potluck Dinner at 12:30 PM. Talk-in on 146.97. Contact *Stan KF0KS, (417) 452-3801.*

SOUTH DARTMOUTH, MA The South Eastern Mass ARA will hold their 7th annual Hamfest/Flea Market from 8 AM-3 PM at the club grounds at 54 Donald St. Talk-in on 147.00/.60. Contact *Michael Enos, P.O. Box 79064, N. Dartmouth MA 02747.*

SUFFERN, NY The ARRL Hudson Div. Convention will be held at the Rockland Comm. College Field House, beginning at 9 AM. ARRL President George Wilson W4OYI, and staff members from ARRL Headquarters, will be among the featured guests. Flea Market. More. Talk-in on 147.165/.765. Vendors ONLY may call the convention's special Vendor Info Line at *(914) 426-1488.*

SEP 17

BERWICK, PA The Columbia Montour ARC will host a Hamfest/Computerfest at Nescopeck Township Firehall Grounds, starting at 8 AM. Tailgating setup at 6 AM. VE Exams at 10 AM; Walk-ins welcome. Talk-in on 147.225(+), and 146.52 simplex. Contact *Dave WC3A, (717) 752-6851.*

GONZALES, LA "Gonzales Hamfest `94" will be held at the Gonzales Rec. Center from 8 AM-3 PM. Sponsor: The Ascension ARC. Talk-in on 147.225(+), CTCSS 107.2. Contact *George Turner KB5EOC, 16179 Galves Ave., Prairieville LA 70769. Tel. (504) 622-3598.*

SANTA ROSA, CA Sonoma County Radio Amateurs, Inc. will hold their 12th annual Ham Radio Flea Market from 7:30 AM-2 PM at the Holy Ghost Hall, 7960 Mill Station Rd., just off Hwy 116 north of Sebastopol. Set-up at 6:30 AM. Talk-in on 146.13/.73. For tickets and info, write to *SCRA, Box 116, Santa Rosa CA 95402.*

RANDOLPH, VT The Central Vermont ARC will host the "Fall Foliage Hamfest/Computer Fair" from 9 AM-3 PM at the Judd Gym. at Vermont Tech. College. VE Exams at 12:30 PM. Forums. Talk-in on 147.09/.69/R, 146.625/.025/R, and 146.52 simplex. For reservations, make checks payable to: *Central Vermont ARC*, and send to *Tom Girardi WA1YNU, P.O. Box 261, Waterbury VT 05676. Tel. (802) 244-7836*; or *Steve Allen KD1UP, RR1 Box 2409, Moretown VT 05660. Tel. (802) 496-7696.*

SANTA FE, NM The 1994 Northern New Mexico Hamfest, sponsored by the Northern NM ARC, will be held at Glorieta Baptist Conf. Center. Talk-in on 145.19 (144.59 input), 147.90/.30, and 146.52/.52. For camping reservations, contact the *Glorieta Baptist Conf. Center, P.O. Box 8, Glorieta NM 87535.* For hotel info., call *(505) 757-6161.* For hamfest details, contact *Helenrose Burke W5IXS, P.O. Box 73, Ojo Sarco NM 87550. Tel. (505) 689-2367.*

SCOTTSDALE, AZ The Family AR Event will hold its 2nd annual event at Rawhide Western Town, 23023 N. Scottsdale Rd. RC airplane demo. Weathersat Forums. Emergency Ham Radio. Activities for children. Swap meet area opens at 6 AM. Exhibit hall opens at 9 AM. Contact *Len Winkler KB7LPW, P.O. Box 9219, Phoenix AZ 85068. Tel. (602) 861-0303.*

SEP 17-18

VIRGINIA BEACH, VA The ARRL Roanoke Div. Convention and Virginia Beach Hamfest/Computer Fair will be held at the Virginia Beach Pavilion. For commercial booths, contact *Lewis Steingold W4BLO, 1008 Crabbers Cove Ln., Virginia Beach VA 23452*, or call *(804) 486-3800.* For tickets and tables, contact *Manny Steiner K4DOR, 3512 Olympia Ln., Virginia Beach VA 23452. Tel. (804) HAM-FEST.*

SEP 18

ADRIAN, MI The AARC Hamfest/Computer Show will be held at Lenawee County Fairground 8 AM-2 PM. VE Exams; walk-ins OK. Talk-in on 145.37(-). Get more details from *Greg KZ8X, 4281 Mohawk Trail, Adrian MI 49221. Tel. (517) 263-1153.*

CLEMENS, MI The 22nd annual L'Anse Creuse ARC Swap and Shop will be held from 8 AM-2 PM at L'Anse Creuse H.S. VE Exams at 11 AM. Contact *Don Olszewski WA8IZV, (810) 294-1567: Prodigy ID# SSTG41a.* Talk-in on the ECHO Rptr., 147.08/.68 MHz, or on 146.52 MHz simplex. For info, send SASE to *Dave Herrington N8NLK, 165 Crocker Blvd., Mt. Clemens MI 48043-2546. Tel. (810) 465-2797.*

LAUREL SPRINGS, NJ The 46th annual South Jersey RA, Inc. "HAMfest" will be held at Pennsauken H.S. starting at 8 AM. Reserve spaces by contacting *Diane Narfis N2LCQ, 17 Roosevelt Dr., Laurel Springs NJ 08021. Tel. (609) 227-6281.* VE Exams on a walk-in basis 9:30 AM until ???. Talk-in begins at 7 AM on the day of the event, on 145.290 (-600).

NEWTOWN, CT The Western CT Hamfest will be sponsored by the Candlewood ARA from 8 AM-1 PM at the Edmond Town Hall, Rt 6. Flea Market. Displays. Talk-in on 147.12(+). Contact *Ken Weith KD1DD, Box 3441, Danbury CT 06813. Tel. (203) 743-9181.*

SEP 24

ELMIRA, NY The Elmira ARA will present the 19th annual Internat'l Hamfest/Computerfest at the Chemung County Fairgrounds, Horseheads NY, from 6 AM-4 PM. Flea Market. QSL Contest. VE Exams; contact *Bill, (607) 962-1134.* To purchase tickets, contact *Dave Lewis, RD1 Box 191, Van Etten NY 14889. Tel. (607) 589-4523.* Dealers, contact *Jay, (607) 733-0761.* Talk-in on Rookies Rptr. 147.96/.36 and 444.20.

SEP 25

FRAMINGHAM, MA The Framingham ARA will hold its Fall Flea Market and VE Exams at Framingham H.S. (on A Street). Doors open at 9 AM to early bird buyers, and 10 AM to all buyers. To reserve tables contact *Lew Nyman K1AZE, (508) 879-7456.* Make checks payable to *FARA, P.O. Box 3005, Framingham MA 01701.* To register for exams, send check for $5.75, payable to *ARRL/VEC*, to *Dick Marshall WA1KUG, 37 Lyman Rd., Framingham MA 01701.* Walk-ins not accepted after 10 AM. Talk-in on 147.15 rptr.

LONGMONT, CO A Hamfest will be sponsored by the Boulder ARC, beginning at 8 AM at Boulder County Fairgrounds Exhibition Bldg., Nelson & Hover Rds. VE Exams. Talk-in on 146.70(-) and 147.27(+). To reserve tables, contact *BARC, P.O. Box 2033, Boulder CO 80306-2033. Tel. (303) 441-3883.*

ST. PETERS, MO St. Peters ARC Swapfest will be held from 7 AM-1 PM at St. Charles County Comm. College Campus, 4601 Mid Rivers Mall Dr. Flea Market. Talk-in on 145.41 MHz and 444.275 MHz. Contact *Jay Underdown W0OGS, 58 Judy Dr., St. Charles MO 63301. Tel. (314) 723-4200.*

YONKERS, NY A Giant Electronic Flea Market, sponsored by the Metro 70cm. Network, will be held at Lincoln H.S. on Kneeland Ave. from 9 AM-3 PM. VE Exams. Talk-in on 440.425 MHz PL 156.7, 223.760 MHz PL 67.0, 146.910 Hz, 443.350 MHz PL 156.7. Contact *Otto Supliski WB2SLQ, (914) 969-1053.*

OCT 1-2

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL KY State Conv. will be held at the Commonwealth Conv. Center in downtown Louisville. Mail requests for tickets or info to *The Greater Louisville Hamfest Assn., P.O. Box 34444-Q, Louisville KY 40232-4444.* For commercial spaces, call *(812) 948-0037*; Flea Market spaces, *(812) 282-4898.*

OCT 2

HUNTINGTON, IN The Huntington County ARS will sponsor its 6th annual Hamfest from 8 AM-1 PM at the PAL (Police Athletic League) Club. Set-up at 6 AM. VE Exams. Flea Market. Talk-in on 146.085/.685 and 448.975/443.975. Contact *Chris Richardson N9QVI, P.O. Box 284, Huntington IN 46750. Tel. (219) 356-0319.*

SAN DIEGO, CA Over a dozen San Diego ARCs, the American Red Cross, and the Salvation Army, will stage the 3rd annual "Ham Radio Roundup." Location: Missile Pk., Missile Rd. & Clairemont Mesa Blvd. Each club or agency (ARRL, MARS, and others) will display the various aspects of amateur radio. Set-up begins at 7 AM; gates open at 10 AM. Contact *Harry A. Hodges WA6YOO, (619) 743-4212.*

SPECIAL EVENT STATIONS

AUG 14

FULTON, NY The Oswego County AR Emergency Serv. will operate Station KC2QV 1200Z-2100Z from Fulton's annual Riverfest. Operation will be in the middle of the General 80, 40, 20, 15, and 10 meter phone bands, the Novice portion of 10 meters, and 147.75/.15 MHz. For a certificate, send your QSL card and a large SASE to *KC2QV, 366 South Fifth St., Fulton NY 13069.*

AUG 19-SEP 5

ISLINGTON, ONT., CANADA Amateur Radio clubs around Toronto Canada will operate Station VE3CNE 1400Z-0200Z each day as part of the Canadian Nat'l Exhibition in Toronto. Freq.: CW - 80 meters: 3.645/.700 MHz; 40 meters: 7.045/.145 MHz; 20 meters: 14.045; 15 meters: 21.045/.145 MHz. SSB - 80 meters: 3.745/.865 MHz; 40 meters: 7.065/.235 MHz.; 20 meters: 14.145/.245 MHz; and 21.345 on 15 meters. Talk-in on 145.410 MHz. Contact *(416) 393-6000* for more details.

SEP 1-5

MT. PLEASANT, IA Station W0MME will be operated by the Mt. Pleasant ARC during the Midwest Old Threshers Reunion. Voice and CW operation will be in the General portion of 80-10 meters. For a QSL, send an SASE to *Dave Schneider WD0ENR, RR3 Box 307A, Mt. Pleasant IA 52641.*

SEP 2-4

HAGERSTOWN, MD The Antietam Radio Assn. will operate Club Station W3CWC to commemorate the 125th Anniversary of the birth of Hiram P. Maxim W1AW, Founder of the ARRL. They will also celebrate the installation of a brass headmarker at his grave site in Rose Hill Cemetery. Operation will be from 1500Z Sep. 2nd-0400Z Sep. 3rd; also, 1200Z Sep. 3rd-2400Z Sep. 4th. Freq.: CW - 3.640, 7.045, 14.040, 21.040, 28.040. SSB - 3.920, 7.240, 14.240, 21.295, 28.350 MHz. For a commemorative certificate, send your QSL and an SASE to *Antietam Radio Assn., Attn: Special Event Station W3CWC, P.O. Box 52, Hagerstown MD 21741-0052.*

SEP 4

PANAMA, REP of PANAMA The 23rd Anniversary Contest of Radio Club Panama will take place 0001 GMT-2359 GMT. For details, contact *Radio Club Panama, Anniversary Contest, P.O. Box 10745, Panama 4, Republic of Panama. Fax: (507) 26-4477. Packet:HP1COO@HP1CDW.#PANCTY.PAN.CEAM.*

SEP 4-5

AUBURN, IN The Northeastern Indiana ARC will operate a Special Event Station to commemorate Auburn Cord Duesenberg Days. Operations will be 1400Z-2200Z in the lower 25 kHz of the General bands on 40 meters and/or 80 meters. For a commemorative QSL, send confirmation and SASE to *NEIARC, P.O. Box 745, Auburn IN 46706.*

SEP 10

GREELEY, CO The Weld ARS will operate Station WA0DDC from 1600Z-2100Z, to celebrate Potato Day at Centennial Village. Frequencies: 14.250 MHz and 28.490 MHz. For a certificate, send your QSL, with a business size SASE to *Rick Hubbard WA0DDC, P.O. Box 5116, Greeley CO 80631.*

SEP 10-11

NORWALK, CT The Greater Norwalk ARC will operate KA1OFN 1300Z-2100Z Sep. 10th, and 1300Z-1900Z Sep. 11th, to celebrate the 17th Annual Norwalk Oyster Festival. Operation will be in the lower 25 kHz of the General phone band, on 40, 20 and 15 meters, and on the Novice 10 meter phone subband. For a certificate, send a QSL card and a 9" x 12" SASE to the *Greater Norwalk ARC, 324-7 Main Ave., Box 115, Norwalk CT 06851.*

SAXONBURG, PA The Butler Co. AR Public Serv. Group will operate KD3RT to honor the Mayor of Saxonburg, Reldon Cooper W3SYV, 1400Z-2200Z Sep. 10th, and 1400Z-2000Z Sep. 11th. Location: Saxonburg Festival of the Arts. Phone will be on the lower portion of the 40 and 20 meter General subbands. For a certificate, send a 9" x 12" SASE to *BCARPSG, Inc., P.O. Box 1692, Butler PA 16003.*

SEP 10-16

MAASTRICHT, THE NETHERLANDS During World War II, the German occupation of Maastricht ended on Sep. 14th, 1944. Maastricht was the first city in the Netherlands to be liberated. The operation was carried out by the 30th Infantry Div. of the 19th US Army Corps, Old Hickory Div. In commemoration of this occasion, Station PA6OHD (Old Hickory Div.) will be in operation in the lower portion of 20 and 15 meters, phone and CW.

SEP 12-17

LINWOOD, NJ The Southern Counties ARA will operate K2BR from the Miss America Pageant in Atlantic City (Absecon IS., IOTA: NA 111). Freq.: Phone - 25 kHz inside lower General class bandedge; CW - 65 kHz inside lower General class bandedge; Novice - 28.100/.500 kHz. Operation will begin 10 AM EST on Sep. 12th. QSL - SASE via *SCARA, P.O. Box 121, Linwood NJ 08221.*

SEP 15-20

THE NETHERLANDS The Nijmegen RAC will operate Station PA6OMG to commemorate the Sep. 17, 1944 paratrooper effort to secure bridges in preparation for the advance of the British Army over Dutch waterways (Operation Market Garden). PA6OMG will operate in CW and phone on all HF bands during the week. If possible, WWII radio equipment will be used to make connections. Send QSL cards to *QSL Manager, PA0KHS, NL-Region 35,* via the Dutch QSL-bureau. For local visitors, a 2m and 70cm talk-in will be on standby. A QSO with PA6OMG will be valid for the Noviomagum Certificate.

SEP 16-18

CHARLESTON, SC The Charleston ARS will operate WA4USN 1300Z-2300Z to commemorate the BOC Challenge 1994-95, a single-handed round-the-world yacht race. Freq.: 7.250, 14.045, 14.250, 21.045, 21.250, the Novice CW portion of the 40 meter band, and 146.790. All frequencies +/- 5 for QRM. 2 meter operation on Sep. 17th only. For a QSL, send QSL and SASE to *Sheila Frank KC4UDD, 614 Longstreet Circle, Summerville SC 29483.*

SEP 17

NEGAUNEE, MI The Hiawathia ARC will operate W3KGW 1300Z-2030Z to commemorate the 150th Anniversary of the locating of iron ore on the Marquette Range. Operation will be on the General band and on 146.91. Send QSL and SASE to *Charles Waters, 970 N. Westwood Dr., Ishpeming MI 49849.* Please put contact number on envelope.

PARK CITY, UT The Mercury ARA, in cooperation with the Great Salt Lake Council of the Boy Scouts of America, will operate K2BSA/7 during the Utah Heritage Jamboral. Operation will be from 0000Z-1800Z. Freq.: 3.870, 7228, 14287, 21395. Send QSL and SASE to *MARA, P.O. Box 11201, Salt Lake City UT 84147-0201.*

SEP 17-18

READING, PA Berks ARS will operate WA3MFT from 1600Z Sep. 17th-2000Z Sep. 18th, to commemorate the renovation to the landmark PAGODA. Phone frequencies: 3.880, 7.280, 14.280, 21.380, 28.480; packet on 145.09. For a certificate, send your QSL and a 9" x 12" SASE to *Berks Amateur Radio Soc., P.O. Box 12632, Reading PA 19604.*

SEP 19

DANVILLE, PA Liberty-Valley Elementary School will operate WC3A, N3IRN, and N3LQS on all amateur bands, from 1300Z-1900Z. For a certificate, send your QSL to *D. Miguelez N3POB, Liberty-Valley School, 175 Liberty-Valley Rd., Danville PA 17821.*

SEP 20-24

CHALK RIVER, ONT., CANADA The Renfrew County ARC will operate Station CJ3IPM to commemorate the Internat'l Plowing Match coming to Renfrew county for the first time. The RCARC will operate on all bands, and a QSL card is available by sending an SASE to *RCARC, P.O. Box 39, Chalk River, Ont., Canada K0J 1K0.*

SEP 23-25

PEA PATCH ISLAND, DE The Tri-County Amateur Group will operate KD3XN 1400 UTC-2100 UTC from the Civil War's historic Fort Delaware. Operations will be in the General and Novice portions of 10, 12, 15, 17, 20 and 40 meters. For an overhead photo QSL, send an SASE to the operator worked.

WALLA WALLA, WA The B.P.O. ELKS Lodge #287 is celebrating its 100th Anniversary. They will issue a certificate for working 5 Walla Walla stations. Please send names and calls on your QSL card to *Robbie Gallo KB7OBW, 351 E. Rose, Walla Walla WA 99362.* Please also send a 9" x 12" SASE.

SEP 24

ADDISON COUNTY, VT The Addison County ARA will operate N1BBR and WX1O from 1400Z-2100Z, to celebrate the Apple Harvest in VT. Operation will be in the General portion of the 20 and 40 meter CW and phone bands, as well as the Novice 10 meter phone band. Operation and talk-ins on local 2 meter rptrs. If all goes as planned, an AM antique station will run on approx. 14.285. For a certificate, send QSL info, $1 US, and a 9" x 12" SASE to *Elaine Eldridge N1IJW, P.O. Box 10, New Haven VT 05472-0010.*

ERWIN, TN The Unicoi County AR Serv. will operate AC4QF 1300Z-2100Z to commemorate the 15th annual Erwin/Unicoi County Apple Festival. Operation will be 14.265 and 7.265, phone only. For a QSL card, send QSL and a #10 SASE to *UCARS, P.O. Box 185, Erwin TN 37650-0185.*

SOUTH HOUSTON, TX The Pearland ARC will operate AB5GU as part of the city's Centennial celebration. Freq.: 28.410, 21.310, 14.260, 7.230, and 7.125. All school stations will be active during the preceding week. Jamieson M.S. will operate KI5MB; Pearland H.S. will operate KB5RGJ. Certificates will be sent to stations working all three locations. For QSL or a certificate, send an SASE via *Marty Haley AB5GU, 803 Ave. I, South Houston TX 77587.*

SEP 30-OCT 1

ISHPEMING, MI The Hiawatha ARA will operate Station KB8DNS Sep. 30th 1700 UTC-0200 UTC, and Oct. 1st 1500 UTC-2000 UTC. This is to commemorate the 40th Anniversary of the Nat'l. Ski Hall of Fame; and the 90th Anniversary of the U.S. Ski Assn. Freq.: General phone and CW Novice on 80, 75, 40, 15, 20, 10, and 2 meters. For a certificate, send a 9" x 12" SASE to *Rod KB8DNS, 1740 Rosewood Ln., Ishpeming MI 49849.*

OCT 1

ANAMOSA, IA The Jones County ARC will operate N0CWP 1500Z-2000Z, to celebrate their annual Pumpkinfest. Operation will be in the lower 50 kHz of the General subbands. For a certificate, send confirming QSL to *Jim McClintok N0CWP, Box 462, Morley IA 52312.*

OCT 1-2

PITTSBURGH, PA The Breezeshooters ARC will operate Station W3XX 1400Z-2100Z Oct. 1-2, from the submarine U.S.S. Requin, docked at the Carnegie Science Center. Operation will be CW on 7.123 and 21.123, and phone on 7.250, 14.250, 21.350, 28.460, and 146.52. For a certificate and QSL card, send QSL and an 8 1/2" x 11" SASE to *Ron Berry WB3LHD, 326 Sunset Dr., Bethel Pk., PA 15102.*

Number 24 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

I'm sure we all agree that propagation conditions for this past summer were very poor. This month, however, we may see some slight improvement as summertime thunderstorms and high absorption levels give way to the usually better autumn propagation on the HF bands.

First, the bad news: September 1-3, the 9th and 10th, the 12th-15th, and again the 26th, are likely to exhibit some disturbances in the ionosphere, hence Poor and sometimes Very Poor propagation conditions for DX and even for intra-country QSOs.

The good news, however, is that days of Good or Fair propagation on the HF bands will outnumber the others, and the chart will show which days to pick for your operations.

It's always worthwhile to occasionally monitor WWV at 18 minutes past any hour to obtain the latest values of Solar Flux (above 80 is best), Boulder A index (10 or below), and Boulder K index (2 or below). Try to plan your operating when the "numbers" are favorable for best results.

10 and 12 Meter Bands

Generally Poor conditions worldwide on most days, with occasional openings on exceptionally Good days to tropical areas during daylight hours. These bands will close before local darkness.

15 and 17 Meter Bands

Circuits to Africa and Central and South America from the Northern Hemisphere may be open on Good days, with some nice short skip openings out to 1,000 miles or so on these days.

20 and 30 Meter Bands

As usual, the 20 meter band ought to be your choice for any serious worldwide DX work between the hours of sunrise and sunset, local time. Also, this band should remain open until well after sunset for long openings into the Southern Hemisphere. Short skip to about 2,000 miles or so should be available on many days of the month.

The 30 meter band will act a little like 20 and a little like 40. Expect DX, if any, between sunset and sunrise, and expect fading to prevail on all paths. Signals from the east will peak between sunset and midnight (local time) and from the west between midnight and sunrise (local time). Daytime short skip out to 1,000 miles and nighttime short skip beyond 1,000 miles may be expected.

40 and 80 Meter Bands

Forty meters will behave much like the 30 meter band as shown above.

Eighty meters ought to provide some good DX between sunset and sunrise. Lessening of thunderstorm QRN will be welcome. Short skip during the day to 350 miles may be expected on Good days, while skip to 1,000 miles and beyond ought to prevail after dark, although I've found that even in September, high daytime signal absorption levels, peaking at noon or 1 p.m. local time, will preclude operations.

160 Meter Band

There won't be any daytime skip available, but short skip openings and DX openings to some areas of the world at night may be anticipated. Don't expect wonders, however, unless you have excellent antenna systems, such as Beverages for receiving and verticals for transmitting. DX, if any, should peak around midnight and again around sunrise. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20						20					15
AGENTINA	20	40A	20	40					10		20A	20A
AUSTRALIA	20	40A		40	40	20	20	20		20	15	15
CANAL ZONE	40A	40A	40	40	40		20	20A	10	15A	20A	20
ENGLAND	40	40	40	40				15	20A	20		
HAWAII	20	20				20	20			15	15	15
INDIA						20	20	20				
JAPAN	20					40	20				15	15
MEXICO	40A	40A	40	40	40		20	20A	10	15A	20A	20
PHILIPPINES							20					
PUERTO RICO	40A	40A	40	40	40	20	20A	15A	15A	20A	20	40A
SOUTH AFRICA	40	40A	20					15A	15A	20A	20A	20A
U.S.S.R.	20	20					20	15			20	20
WESTCOAST	20A	20	40	40	40	40	40	20	15	15A	15A	15A

CENTRAL UNITED STATES TO:

ALASKA	20				40	40	20	20			15	15
ARGENTINA	20	40	40	40						15A	20A	20A
AUSTRALIA					40	40	20	20	20		15	15
CANAL ZONE	40	40	40	40	40	20	20	15	15A	15A	15A	15
ENGLAND	40	40	40	40				15	15	20A	20	20
HAWAII	20	20	20	40	40		20	20		10	10	15
INDIA	20	20					20	20				
JAPAN	20					40	20	20				15
MEXICO	40	40	40	40	40	20	20	20	20	15A	15A	15
PHILIPPINES	20A	20					20	20			15	15
PUERTO RICO	40	40	40	40	40	20	20	20	20	15A	15A	15
SOUTH AFRICA							10	15A	15	20A	20A	20
U.S.S.R.							20	20A	15	20	20	

WESTERN UNITED STATES TO:

ALASKA	20A	20A	20			40	40	40A	20	20	20	20A
ARGENTINA	20A	20	40A	40						15A	15A	15A
AUSTRALIA	20A	20A	20	20	40	40	40		20	20	15	15
CANAL ZONE	20	20	40A	40A	40			20	20A	15A	15A	15A
ENGLAND			40					20	15	20A	20	20
HAWAII	15	20A	20A	40A	40	40	40	20	20	20		15A
INDIA	20A	20A						20	20			
JAPAN	20A	20A	20			40	40	40A	20	20	20	20A
MEXICO	20	20	40A	40A	40			20	20A	15A	15A	15A
PHILIPPINES	15			20		40	40		20	20		
PUERTO RICO	20	20	40A	40A	40			20	20A	15A	15A	15A
SOUTH AFRICA	20							20	20	15	20	20
U.S.S.R.			40	40				20A	15A	10	20	20
EAST COAST	15A	20	40	40	40	40	40	20	15	15A	15A	15A

A=Next higher frequency band may also be useful. G=Good, F=Fair, P=Poor

SEPTEMBER 1994

SUN	MON	TUE	WED	THU	FRI	SAT
				1 P	2 VP	3 VP-P
4 P-F	5 F	6 F-G	7 G-F	8 F-P	9 P	10 P-F
11 F	12 F-P	13 P	14 P	15 P-F	16 F-G	17 G
18 G-F	19 F-G	20 G	21 G	22 G	23 G	24 G-F
25 F-P	26 P	27 P-F	28 F	29 F-G	30 G	

Number 25 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the October classified ad section is August 11, 1994.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $9.95 each, ppd USA. Send to: **ALLABOUT BOOKS**, Dept. S, P.O. Box 22366, San Diego CA 92192. BNB200

CUSTOM MADE-HAND TOOLED leather products with your initials, name, call letters. Photo's & estimates available. Key rings, wallets, belts, purses, hanging signs, specialty items. GREAT GIFT. **LEATHER & WEST,** 67 Causeway Rd., West Swanzey NH 03469. (603)352-6256. 9-4 pm. M-F ET. BNB215

OVER 500 TAILGATE SPACES THIS YEAR. Suncoast Amateur Radio and Computer Convention. November 19 & 20, 1994. Florida State Fairgrounds. Write: **FGCARC,** P.O. Box 2423, Clearwater FL 34617-2423. BNB265

WANTED: AUDIO EQUIPMENT. Tube, Solid State, McIntosh, Marantz, Tannoy, EV-Patricians, Western Electric, Nakamichi preferred. John, (410)465-2699. BNB268

QSL SAMPLES- 50 cents. **SAMCARDS,** 48 Monte Carlo Dr., Pittsburgh PA 15239. BNB275

DWYER WIND SPEED INDICATOR only $55.00 plus $4.00 S/H. For home or office. Accurate, low-cost, practical. Roof mounted pickup. Send check or M.O. to: **RAD-MON COMPANY,** Dept A, Box 751, Marathon NY 13803-0751. (NY Residents add Sales Tax) BNB285

ATTENTION HAMS! Subscribe to *6-50 Worldwide for Six Meter Enthusiasts*, *DX Digest for DX Chasers*, or *The Novice/Tech Report*. Call (817)694-4047 or FAX (817)694-2522. BNB292

COMMODORE 64 REPAIR. Fast turn around. **SOUTHERN TECHNOLOGIES AMATEUR RADIO,** 10715 SW 190th Street #9, Miami FL 33157. (305)238-3327. BNB295

KIT BUILDERS— NEW, SYNTHESIZED qrp Transmitter/Transceiver, the ARK4. Full Transceiver Kit w/case only $199.95. One board, no wiring, top quality components & PCB. GUARANTEED TO WORK. For info send SASE; Call/Write to order: **S & S ENGINEERING,** 14102 Brown Road, Smithsburg MD 21783; (301)416-0661. BNB304

WANTED: Electron Tubes, ICS, Semiconductors. **ASTRAL,** P.O. Box 707ST, Linden NJ 07036. Call (800)666-8467 BNB307

KENWOOD AUTHORIZED REPAIR. Also ICOM, Yaesu. **GROTON ELECTRONICS,** Box 379, Groton MA 01450. (508)448-3322. BNB310

UNIQUE ANTENNA GIVES 30db GAIN on all HF bands. Complete plans, $6.95. **AA2KE** Bob Christie, 215-28 Spencer Ave., Queens Village, NY 11427. BNB319

PROGRAMMABLE COUNTER–Works with ANY VFO Rig! Get a digital display for your rig, 100 Hz resolution. You can read the tuned frequency directly, no need to calculate offsets. Counts to 40 Mhz, up OR down. Counter Kit, $69.95; Kit w/case, $99.95; Assembled w/case, $139.95. GUARANTEED TO WORK. For info send SASE: Call/write to order: **S & S ENGINEERING,** 14102 Brown Rd., Smithsburg MD 21783; (301)416-0661. BNB334

RCI-2950 OWNERS: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT,** P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

Continued on page 81

Number 26 on your Feedback card

NEW PRODUCTS

Compiled by Charles Warrington WA1RZW

NCG COMET

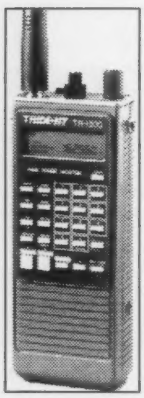
Comet Antenna has introduced the new Quad-Band HF mobile antenna, Model HA-4S, which is pictured on this month's cover. The following coils are standard with the HA-4S: 40, 15, 12, and 10 meters. An optional 20 meter coil is also available: the L-14HS.

The HA-4S is very compact and lightweight, weighing only 1 pound 14 ounces and measuring only 4 feet 10 inches tall. This allows for more convenient mounting options than conventional HF mobile antennas. The HA-4S can be mounted on a trunk lip-style mount such as the RS-820, or a rain gutter mount such as the RS-80.

High quality construction includes a gold-plated PL-259 connector at the antenna's base and a threaded collar that unscrews to expose the hinged base, allowing a 90-degree foldover for clearing garage doors, etc.

For more information on the HA-4S, visit your favorite dealer or contact *NCG Comet, 1275 North Grove St., Anaheim CA 92806; (714) 630-4541, FAX (714) 630-7024.* Or circle Reader Service No. 202.

ACE TRIDENT

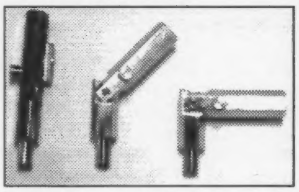


A new hand-held radio receiver covering shortwave and public service band voice frequencies has been introduced by Trident. Frequency coverage ranges from below AM broadcast (500 kHz) to above the new PCS frequencies (1.3 GHz) in the microwave range. Listeners can tune into virtually every kind of voice broadcast, from all over the world.

This new Trident demodulates AM, narrowband FM, and wideband FM signals. Frequencies can be directly entered in the keypad, or the unit will scan for active channels. The receiver has 1,000 permanent programmable memory channels.

The new Trident comes with a 12 VDC cigarette lighter plug, AC battery charger, four AA batteries, earphone, built-in speaker, belt clip, flexible antenna, mounting hardware, and instructions. For more information contact *Ace Communications, 10707 E. 106th Street, Fishers IN 46038; (800) 445-7717, FAX (800) 448-1084.* Or circle Reader Service No. 203.

ANTENNA SALES & ACCESSORIES



ASA has introduced the Fold-Over Model FO-1 three-position adapter for 3/8 x 24 thread antennas, which fits any 3/8 x 24 mount. This unique mount adapter eliminates having to take the antenna off the vehicle when approaching home garages, drive-up bank tellers, and parking garages.

Just push the side button on the FO-1 and fold over to 45 or 90 degrees.

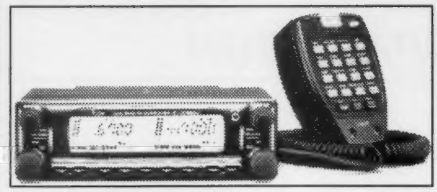
The heavy-duty unit is constructed of weatherproof chrome-plated brass and stainless steel. They are priced at $7 each or three for $20 (add $5 S & H USA, to one location). For more information contact *ASA, PO Box 3461, Myrtle Beach SC 29578; (800) 722-2681.* Or circle Reader Service No. 205.

SGC

SGC has announced the availability of the new SmartPowerCube microprocessor-controlled linear amplifier. The unit significantly boosts power 500 watts intelligently. The unit has a bank of status LEDs on the front panel which function as Built-In Test Equipment (BITE) allowing the operator to spot any problem quickly.

The SmartPowerCube constantly monitors your HF SSB rig's activities, power needs, and antenna condition. In less than 15 milliseconds, it selects the right broadband filter. The unit is protected from preprogrammed shutdown procedures and shuts down automatically in the event of a microprocessor fault.

The SG-500 SmartPowerCube is designed for service in fixed, mobile, and marine applications, and is fully compatible with most HF equipment. The introductory price is $845 for a limited time. For more information contact *SGC Inc., SGC Building, 13737 SE 26th St., P.O. Box 3526, Bellevue WA 98009; (206) 746-6310, (800) 259-7331, FAX (206) 746-6384.* Or circle Reader Service No. 207.



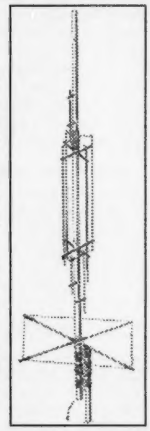
ICOM

Icom has introduced the IC-2700H dual-band mobile transceiver, featuring a detachable front panel. Mount the front panel on your vehicle's dashboard and store the main body in another location, using the optional OPC-438 or OPC-439 accessories. The careful design and dual controls allow for safe and convenient operating while driving.

The IC-2700H features VHF (144 to 148 MHz) and UHF (440 to 450 MHz) coverage, each band having its own tuning knob, Memory/Call button, and Volume/Squelch control. Four selectable backlighting conditions make for easy reading of the display. Full access to all functions are available from the supplied DTMF microphone. Adding the optional HM-90A wireless mike allows "backseat driver" control of the transceiver.

Each band has six scratchpad memories and the IC-2700H provides a total of 100 memory channels. Output power is 50 watts VHF and 35 watts UHF. The suggested retail price is $959. For more information, visit your Icom dealer or contact *Icom America, Inc., 2380-116th Avenue N.E., Bellevue WA 98004; (206) 454-8155.* Or circle Reader Service No. 201.

GAP ANTENNA PRODUCTS



GAP Antennas has introduced the Titan DX multiband antenna. The Titan provides continuous coverage under 2:1, across the entire 10, 12, 15, 17, 20, 30, and 40 meter bands. Plus, it covers over 100 kHz on 80 meters. The Titan is pretuned; it needs no tuner.

The Titan is the answer for the amateur with space limitations. It's easy to set up, requiring no radials. It simply mounts on a 1-1/4" pipe. The Titan is a very manageable 25 feet and weighs 25 pounds.

Like all GAP antennas, the Titan has no traps or coils, but has the unique elevated GAP feed which dramatically reduces earth loss, noise, and instability. Sturdy construction features 6063 aluminum tubing and stainless steel hardware.

GAP antennas are manufactured in the USA. For more information visit your favorite dealer or contact *GAP Antenna Products, Inc., 6010 N. Old Dixie Highway, Vero Beach FL 32967; (407) 778-3728.* Or circle Reader Service No. 204.

OFS WEATHERFAX

OFS WeatherFAX has announced a third-generation weather satellite demodulator—the PCMCIA Convertible for laptop and desk computers. This is the first WeatherFAX decoder card to use Carrier Peak Sampling (CPS) technology, which provides noticeable improvements in image quality and clarity. Whites are whiter, blacks are blacker, gray shades are more accurate, and boundary edges are well-defined. The quartz crystal-locked digital design eliminates all adjustments, and self-test modes verify correct operation.

The compact PCMCIA Convertible is credit-card (PCMCIA Type II) sized and is hot-plugable into IBM compatible laptops and desktops, using the OFS ISA bus converter card. When attached to the audio output of an SSB or VHF receiver, it will acquire high quality weather satellite pictures directly from polar-orbiting and geostationary satellites and from HF Marine FAX.

Prices start at $495. For more information contact *OFS WeatherFAX, 6404 Lakerest Ct., Raleigh NC 27612; (919) 847-4545 (voice or FAX).* Or circle Reader Service No. 206.

BARTER 'N' BUY

Continued from page 79

HR2510, RCI2950, CONNEX 3300, COBRA 148, GALAXY SATURN, plus many more kits to increase your modulation, $19.95. **(800)536-0109.** BNB350

KIT BUILDERS! Complete list of 165+ kit vendors. #10 SASE + $3.00 USD to: **RUTENBER ENGINEERING,** 38045 10th St. E. #H75-AR, Palmdale CA 93550. BNB365

QSL CARDS — Standard and custom. Your ideas or ours. Excellent quality. Foil stamping available. Many designs and type styles. Catalog and samples $1.00 refundable. **WILKINS**, Dept. A, Box 787, Atascadero CA 93423. BNB370

CALLSIGN WRISTWATCH — Free details. **KC6UEC,** 9438 Broadway, Temple City CA 91780. BNB379

NEW NN1G CW SUPER-HET SINGLE BAND TRANSCEIVER KIT. Available in 20M, 30M, 40M, 80M. $59.95 plus $3.75 S/H. (Catalog-2 Stamps). **DAN'S SMALL PARTS & KITS,** 1935 South 3rd West #1, Missoula MT 59801. BNB385

SERVICE . . . . . MONITORS . . . . . WANTED . . . . SERVICE . . . . . MONITORS . . . . . WANTED . . . . Any late model . . . . . Test Equipment. . . . . Call, (408)241-7376. BNB390

CW'ers, USN FLAMEPROOF KEY, new, packed 1955, $59 (shipping included). Collectors, 15 pages, mostly telegraphic, refundable $2.00 plus 2 Stamps. Joseph Jacobs, 60 Seaview Terr., Northport NY 11768. BNB393

IT'S BACK! The return of the HW-8 Handbook! Second printing. Modifications for the Heath QRP rigs. First class mail $11. DX add $4 for air mail shipping. **Mike Bryce, WB8VGE,** 2225 Mayflower NW, Massillon OH 44647. BNB404

MAHLON LOOMIS, INVENTOR OF RADIO; (patented 1872) by Thomas Appleby. (Copyright 1967). Available from **JOHAN K.V. SVANHOLM, N3RF, SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

BROWNIES QSL CARDS SINCE 1939. Catalog & samples $1 (refundable with order). 3035 Lehigh Street, Allentown PA 18103. BNB430

BUTTERNUT ANTENNAS, NEW—in box. (2)HF6-VX, $125.00; (2)HF5B, $200.00; (2)HF2V, $110.00; (1)HF7VX, $150.00. (210)435-6190. BNB435

RADIO DOCTOR VIDEOS for Repair and Alignment of HF Transceivers. Reviewed by Gordon West, January—*73 Magazine*. Videos for popular KENWOOD, YAESU, and ICOM. ORDERS: **(800)788-1416** MC/VISA. **Catalog: SASE** (2 stamps): **RADIO DOCTOR**, 710 Teague Dr., Kennesaw GA 30144. BNB442

FREE...Ham Radio **Gospel Tracts:** DX Contact and Christian Helps, SASE: N1GDP, RAR-OFC, P.O. Box 8, Harmony ME 04942. BNB443

HAMS, DO YOU NEED PRINTER RIBBONS? Lowest prices. Color or Black. Tell us what you need. Free Info. **HARCLY(A),** P.O. Box 830, Coquille, OR 97423. BNB457

SKED-ALARM A Windows based alarm to track your radio schedules. Keeps up to 5 skeds with dual-digital clocks in UTC/local time/date. Records Time/Date/Frequency. Send $22.50 check or M.O. to: **SOFTSPARKS SOFTWARE,** 2601 Cartwright Rd., Suite D-306, Missouri City TX 77459. (Include Name and Call. Texas residents include state tax.) BNB446

GOOD DX LOCATION on the second highest hill on the East Coast. Four bedroom yellow brick house, overlooking Sandy Hook Bay, 65' military type tower. Call **(304)462-5575.** BNB505

CDROM-94 HAM RADIO CALLSIGN DATA BASE Ham Radio Callsign Database with hundreds of PC Compatible programs, radio mods, TCP/IP Usenet, Ham Radio Archives, FCC Rules & Regulations, current exam question pools, and Canadian Call Signs. Only $24.95, with Windows/DOS Interface. Includes shipping! Send check to: **CDROM**, 2348 Karen Dr., #6, Santa Clara CA 95050 or call (408)241-7376 with your Visa or MC. BNB540

DACRON ROPE, WHY RISK FAILURES with aerial supports? Strong, high UV resistant, non-stretch Military Type black DOUBLE (unlike our competitors' single) braided Dacron. 3/32": $.06/ft., 3/16" (770 lb. test): $.11/ft., 5/16": $.16/ft. **DAVIS RF CO. 24 HOUR ORDERS:** (800)328-4773. BNB557

HF TRANSCEIVER, IC-781, mint, in Box, only used 10 hours, manuals included, $3,700.00. Mike, (408)227-7460 after 6 p.m. BNB590

DON'T BUY QSL CARDS UNTIL YOU SEE MY FREE SAMPLES. Also I specialize in custom cards and QSL business cards. Write or call for free samples and custom card ordering information. **LITTLE PRINT SHOP,** Box 1160, Pflugerville TX 78660. (512)990-1192. Mastercard and Visa now accepted. BNB595

WANTED: Western Electric tubes and other tube audio equipment. (800)251-5454. BNB615

DUPLEXER TUNING GUIDE. A complete booklet showing step-by-step instructions on tuning all types of duplexers. Included is theory of operation, detailed diagrams and much more. Send $9.95 plus $2.50 s&h to **RGM PUBLICATIONS**, 533 Main Street, Hillsboro NM 88042. For faster service using a major credit card call (505)895-5333 and order today. 30 day money back guarantee. BNB635

SATELLITE EQUIPMENT Best $$$ USA. (800)851-6534. BNB640

UNIVERSAL PROGRAMMERS Data IO, XELTEK, Logic Devices, Magic IO, EETools, Needhams, from $399.00. EPROM programmers from $117. Call for free catalog. (408)241-7376. BNB645

VHF-UHF-SHF Large SASE. **VHFer,** P.O. Box 685, Holbrook AZ 86025. BNB660

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(Surface delivery may take 2 to 3 months.)

Note: The actual foreign shipping costs will be additional to regular shipping and handling fees.

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL $ _____ ❑Check/Money Order

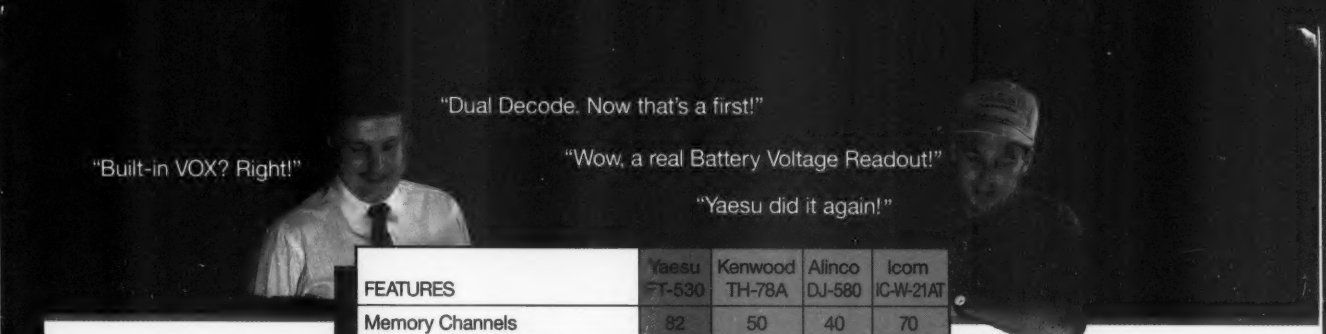
❑ AE ❑ MC ❑ VISA $10 minimum for credit card orders

Card #_____ Expiration Date _____

Signature_____ Phone #_____

Telephone: (603) 924-4117 (800) 234-8458
FAX: (603) 924-8613

UW 9/94



FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger

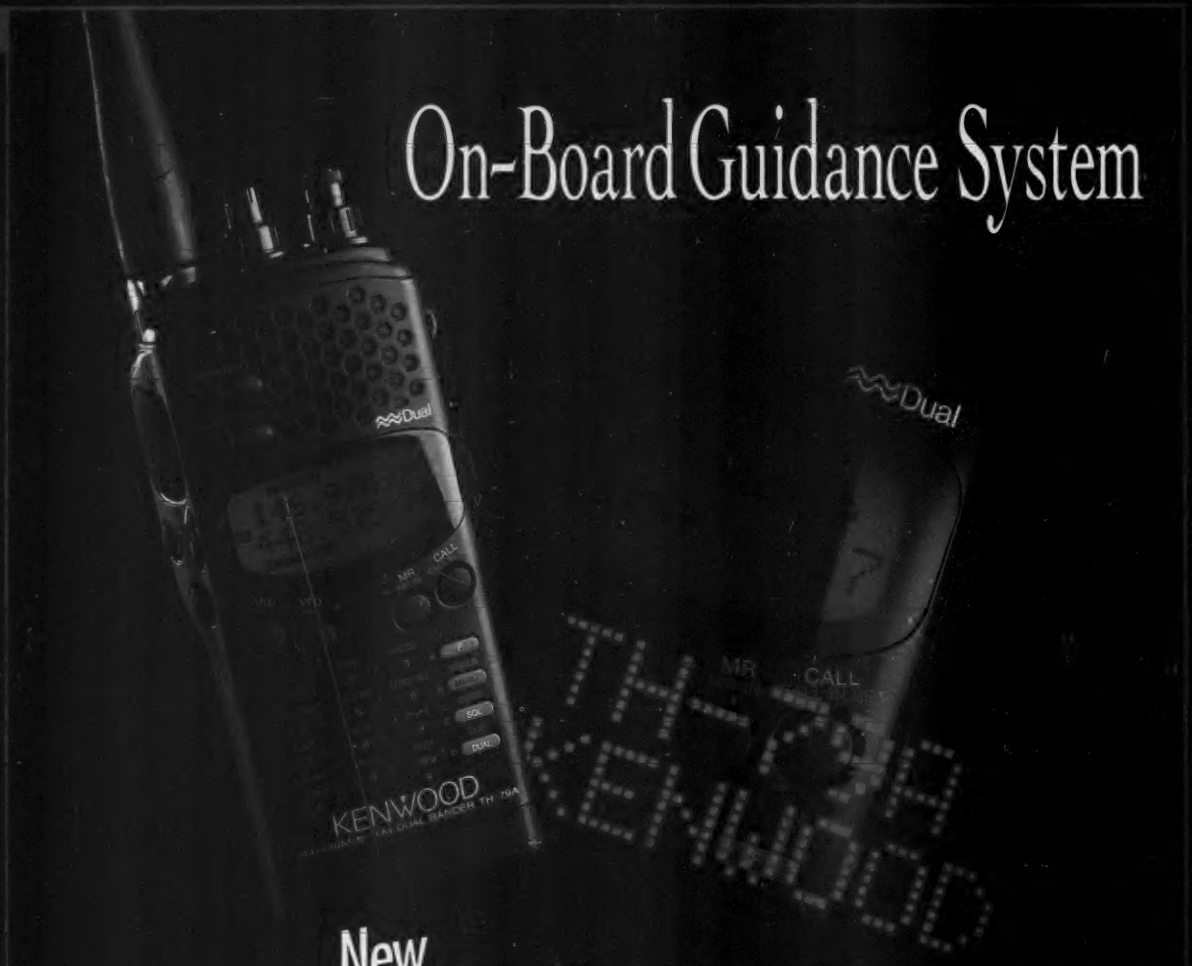
No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

On-Board Guidance System



New TH-79A
FM DUAL BANDER

Information at your fingertips. Everything you need to know about operating the new TH-79A FM dual-bander (144MHz/440MHz) can be viewed in its unique dot-matrix LCD with alphanumeric display. No need for the manual. In addition to this innovative guide function, the TH-79A sports a user-friendly menu system, providing easy access to the many powerful features of this slim-line handheld transceiver. Such as 82 non-volatile memory channels with ID, DTSS and page functions, and a DTMF memory function for auto-dial operation. Full-crossband duplex operation is available, as is the ability to receive two frequencies on the same band (VHF+VHF or UHF+UHF) simultaneously. And thanks to the FET power module, long hours of operation are possible on one charge. With the TH-79A, transceiver technology enters the 21st century.

Features

- 2.7W approx. output (144MHz), 2W approx. output (440MHz) from MOS FET power module and supplied 6V battery; 5W approx. output using optional PB-34
- Dot-matrix LCD with menu/guide system
- 82 non-volatile memory channels with ID
- DTMF keypad with memory function
- DTSS (Dual-Tone Squelch System) with page
- Built-in CTCSS tone encoder/decoder
- Automatic band change ▮ Power-on call sign display
- Auto repeater offset (VHF) ▮ Input overvoltage warning
- 3-position output power control
- Auto power-off and battery save function ▮ Time-out timer
- Multiple scan modes ▮ Cross-band repeater function
- Page answer-back function ▮ Channel display function
- Wideband receiver coverage, including AM receive on the aircraft band*
- Modifiable for MARS/CAP use**

*Specifications guaranteed for Amateur bands only.
**Permits required. Specifications guaranteed for Amateur bands only.

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
•Customer Support/Brochures (310) 639-5300
•Repair Locations/Parts (800) KENWOOD •Bulletin Board Service (BBS) (310) 761-8284
KENWOOD ELECTRONICS CANADA INC

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